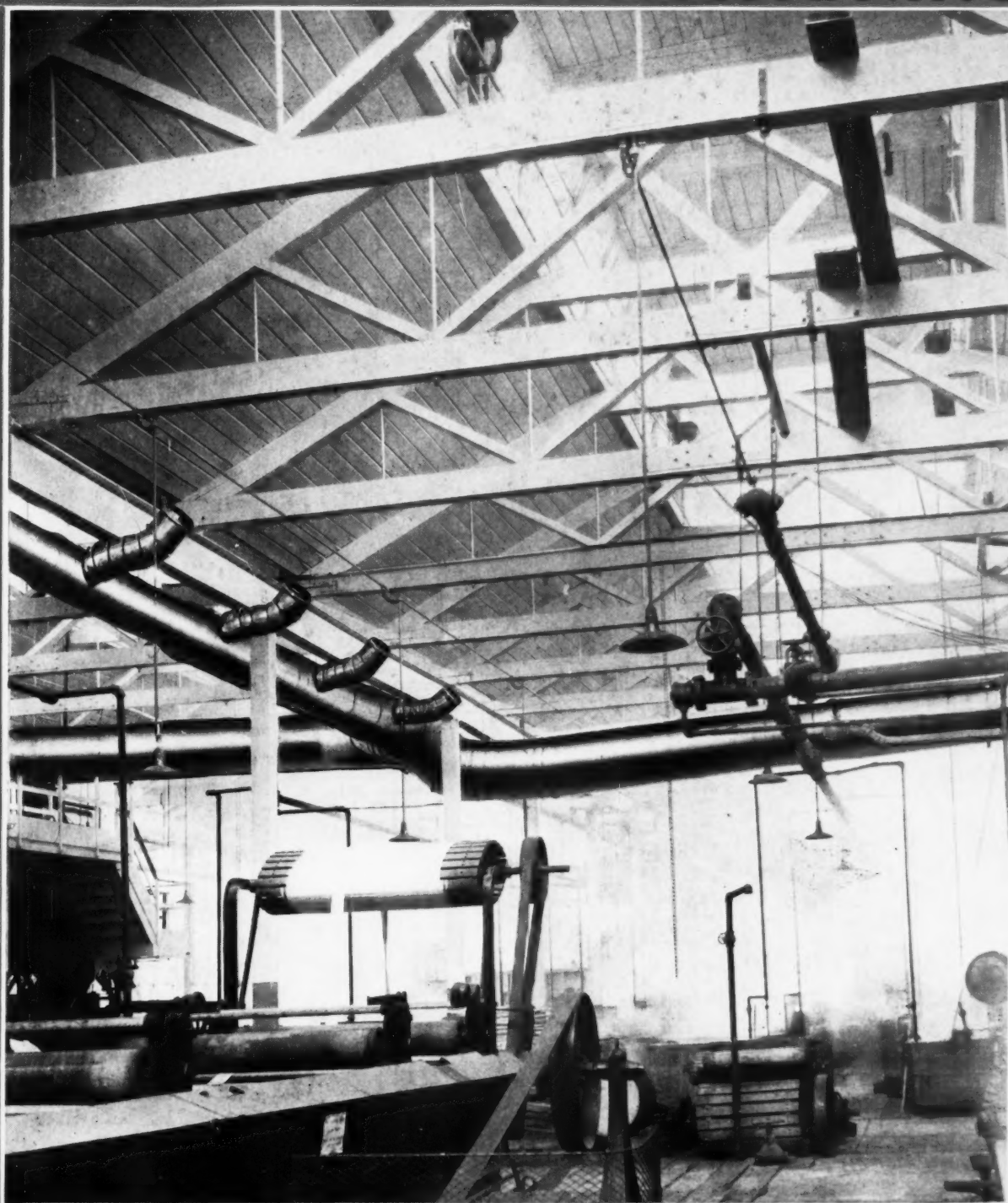


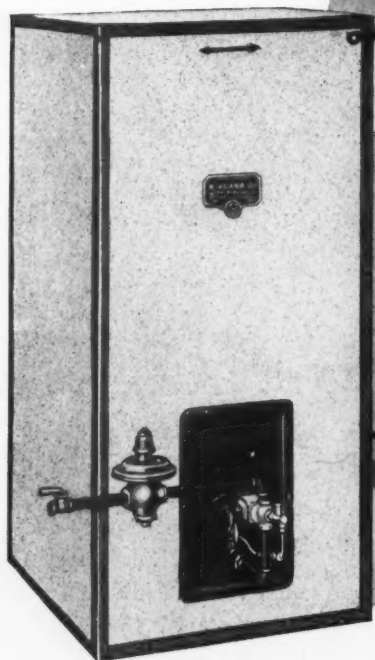
# AMERICAN ARTISAN

FARM AIR HEATING • SHEET METAL  
CONTRACTING • AIR CONDITIONING



ESTABLISHED  
8 8 0

APRIL 11,  
1932



# NOW! SMALLER HOMES CAN AFFORD TO HEAT WITH GAS

## THE ENTERING WEDGE TO VOLUME GAS HEATING SALES

No longer are your gas heating prospects limited to homes of larger income. Here is a gas furnace that enables Mr. *Average* Home Owner to enjoy the luxury of gas heat *economically*—a gas furnace that appeals to *five times* more prospects—your one big opportunity for new profit.

It is the Niagara Auxiliary, a highly efficient gas furnace, installed in connection with the present warm air furnace. It provides the luxury of gas heat during the long months of spring, fall and all but the most severe days of winter. During the few short weeks of raw winter—the weeks the average home owner remembers when he compares heating costs—the coal furnace is used in the ordinary manner. The owner enjoys gas heat during 80% of the heating season at practically no increase in fuel cost. And the mid-winter “peak” gas bills are eliminated.

No matter how many lines of heating equipment you now handle, Niagara Auxiliary fits a *definite place in your sales program* as the entering wedge to the five to one larger market among homes of moderate income.

Let us tell you the complete story.

THE FOREST CITY FOUNDRIES COMPANY • CLEVELAND, OHIO

★  
Installed on either side of any type warm air furnace. Ready for immediate use. Instant change from gas to coal, coal to gas, or both may be used together. Low cost, high efficiency.

★



# NIAGARA

*Auxiliary* GAS FURNACE

# True Talks

with successful sheet metal men

SERIES No. 2

NUMBER 4

## CHICAGO CONTRACTOR KNOWS HOW TO MAKE MONEL METAL JOBS PAY

IT'S only sixteen years ago—in the hectic war years—that the Atlas Copper and Brass Manufacturing Company was founded in Chicago. In the time since then, this progressive sheet metal firm has made remarkable progress—and today it occupies an enviable position as one of the largest concerns of its kind in the Middle West. The large, busy plant shown on this page bears witness to its rapid growth.

One of the principal factors responsible for the Atlas Company's outstanding success has been its policy of constantly looking for new ways to apply Monel Metal and Nickel to the equipment needs of its customers. The company's experience in this direction dates back to the days of the brewery, when sanitary requirements pertaining to brewing equipment were rigidly enforced. In Monel Metal and Nickel, this progressive contractor found the ideal materials for this type of equipment . . . and fabricated many profitable Monel Metal and Nickel units for local breweries.



This Pure Nickel mixer with agitator and dryer is a good example of the expert work turned out by the Atlas Copper and Brass Manufacturing Company, Chicago.



Monel Metal and Nickel jobs played an important part in building this large, daylight sheet metal plant of the Atlas Copper and Brass Manufacturing Co., Chicago.

This start gave the Atlas Company an expert knowledge of Nickel and Nickel alloys, which has since been developed to a point where the firm is now able to fabricate Monel Metal and Nickel equipment for practically any type of application. Wherever equipment must combine rust-immunity, corrosion-resistance, cleanability and durability, Atlas has found that these metals meet their customers' requirements better than any other available materials.

The Atlas Copper and Brass Manufacturing Company is another leader that makes money on its Monel Metal work—and there is no reason why you should not do the same. Profitable Monel Metal business means satisfied customers as

well. Write for more complete information about Monel Metal and about our special sales literature prepared for your use.



Monel Metal varnish kettle with agitator and truck. Built by Atlas for Leneria Union S.A. Mexico, D.F.

Monel Metal is a registered trade mark applied to an alloy containing approximately two-thirds nickel and one-third copper. Monel Metal is laminated, smelted, refined, rolled and marketed solely by International Nickel.

A HIGH NICKEL ALLOY

# MONEL METAL

NICKEL ALLOYS PERFORM BETTER LONGER



THE INTERNATIONAL NICKEL COMPANY, INC., 67 WALL STREET, NEW YORK, N. Y.

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Gravity Warm Air Heating  
Forced Warm Air Heating  
Sheet Metal Contracting  
Air Conditioning  
Merchandising  
Ventilating

# AMERICAN ARTISAN

Founded 1880

VOL. 101

No. 8

APRIL 11, 1932

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# JOBBER WAREHOUSING EVERYWHERE . . .

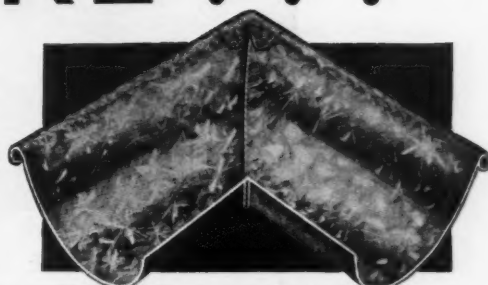
To insure Barnes Quality with Sudden Service, ample stocks are Warehoused Everywhere.

As Barnes Products Build Prestige and Profits for Sheet Metal Contractors—SO—will you find the Barnes Jobber the Progressive Distributor in every community.

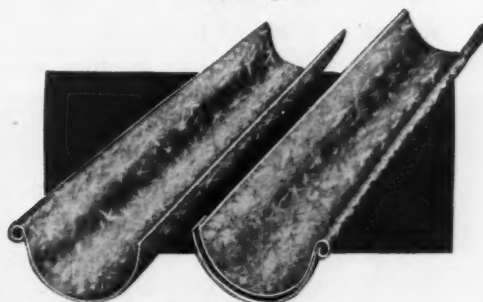
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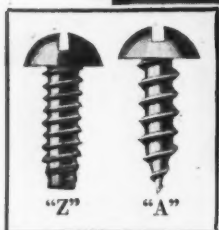
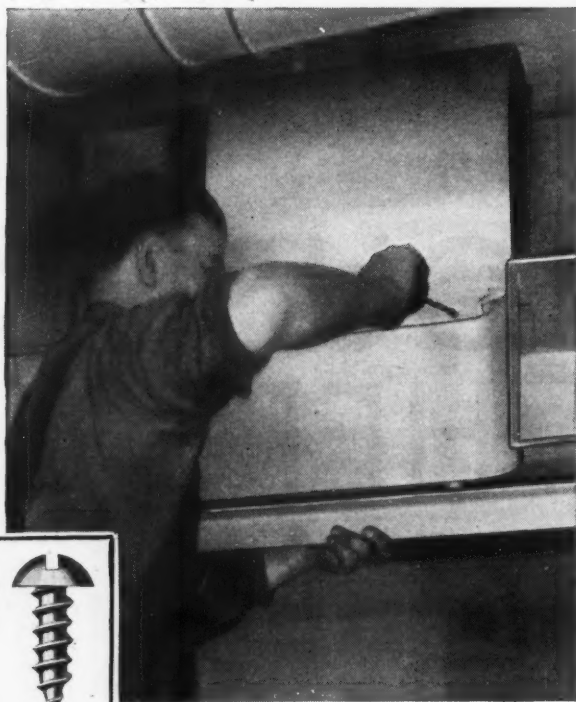
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**BARNES METAL PRODUCTS COMPANY**

*Manufacturers of  
Conductor Pipe, Elbows, Eaves Trough and Fittings. All Sizes. All Metals.*

Chicago, Illinois

# No Cheaper Way to assemble sheet metal — makes a better job, too!



TO MAKE more money, cut the cost of assembling sheet metal. You can do it by using Hardened Self-tapping Sheet Metal Screws. They offer the simplest and quickest, therefore the *cheapest* way. Just turn these unique Screws into drilled or punched holes—they form a thread in the metal—make stronger fastenings than machine screws, too.

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HARDENED SELF-TAPPING

## Sheet Metal Screws

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*These Devices  
save your time —  
do better work*



**Hardened Masonry Nails**—for making fastenings to brick, mortar and concrete. Cheaper than expansion bolts, hooks, anchors for fastening flashings, sheathing, gutters, cornices, etc.



**Hardened Screwnails**—make it unnecessary to use costly wood screws where a secure sheet metal to wood fastening is required. Driven like nails, yet Screwnails hold 4 times better.



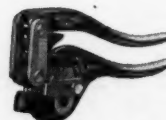
**Hyro Damper Quadrant**—the standard and most efficient damper control. It can be easily and quickly attached to round or rectangular ducts.



**Hyro Dial Damper Regulator**—An inexpensive and greatly favored small damper control.



**Hyro Shur-Grip Handle** for solder irons. Screws on, stays on. Outlasts a dozen common handles.



**Hyro O. X. Metal Punch** is the handiest tool a sheet metal worker can have. Has greater power than any punch of its size—capacity of  $\frac{1}{4}$  in. holes in 14 gauge steel, or equal.

# Here's a Good Way TO GET BUSINESS



INSTRUCT YOUR SALESMEN  
to always mention the familiar  
Armco triangle and what it  
stands for: twenty-six years of  
rust-resisting, low-cost service.



READ "INGOT IRON SHOP NEWS" every month for ideas and suggestions on how to stimulate sales, cut costs, and turn out better work. Published by the Armco Distributors Association, this valuable business-building paper is free to anyone concerned with metal work. Write us if you want to get it regularly.

**ONE GOOD WAY** to increase your business is to mail selling letters to your customers and prospects regularly.

When doing this, keep these five important points in mind:

1. Select names carefully—quality, not quantity, is the key to results. Be sure they are live prospects that need sheet metal work done.
2. Use a convincing, action-getting letter—watch for suggestions on resultful sales letters in the Ingot Iron Shop News.
3. Have the letter reproduced neatly. Use first-class postage if your list of prospects is not too large.
4. Follow up each inquiry personally, not only once but several times if necessary.
5. Do a first-class job with quality materials and then point out to your customer the strong, neat construction as well as durable iron you used. He'll be impressed by your effort to provide a first-class job that will last and save him money.

**THE AMERICAN ROLLING MILL COMPANY**

*Executive Offices: Middletown, Ohio*

*Distributors in the principal cities of  
the United States and Canada*

**PROFITS COME  
WITH BETTER SELLING  
ARMCO PRODUCTS**  
*Help you sell*

*The Hot Mill Roll  
Train in Inland's  
New Plant*

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## **INLAND'S Great STRIP, SHEET, and PLATE PLANT**

YEARS OF STUDY ♦ ♦ ♦

MILLIONS of DOLLARS ♦ ♦ ♦

MONTHS of WORK, and NOW

The Highest Development in Continuous Sheet, Strip, and  
Plate Mills ready to serve you with ♦ ♦ ♦

♦ U. M. PLATES UP TO 69" WIDE

♦ HOT and COLD ROLLED STRIP 6" and WIDER

♦ EVERY GRADE of SHEET STEEL ♦ ♦ ♦ Including Furniture,  
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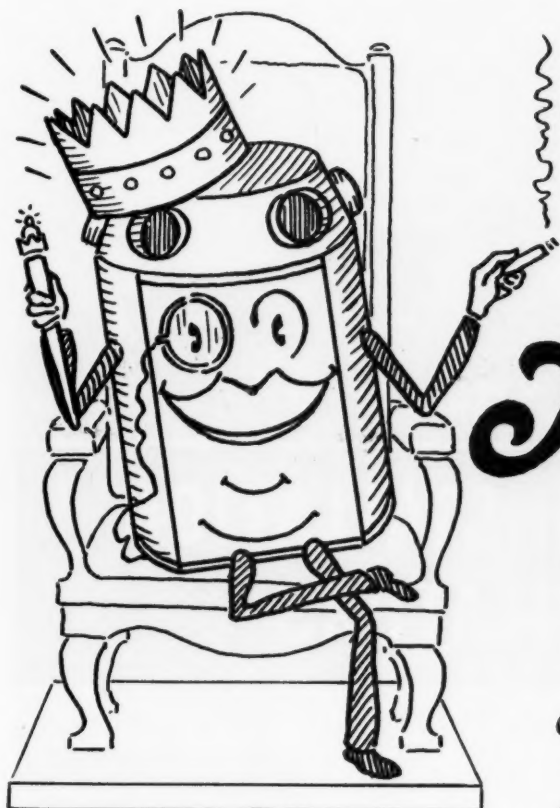
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**ABLE SERVANT OF THE CENTRAL WEST**  
**STEEL**

Sheets Strip Plates  
Bands Structurals Piling

Rails Track Accessories  
Bars Rivets Billets

38 S. Dearborn Street, Chicago

# "How I Became a Leader"



by

## *Agricola* "SUPREME"

"IT'S not a long story—about my phenomenal rise to leadership among furnaces.

"Give people what they want. That's my motto and secret of success. When a man buys a furnace he wants high heating efficiency; quality that assures long service; and a price within reason. I give him these and more.

"By *sticking* to my motto, I've made a host of friends among users and dealers alike. One satisfied user tells his neighbor; the success of one dealer inspires others. And that's how I climbed to the top.

"I'm always glad to meet more dealers who want to rise with me. Let's get acquainted and talk things over.

"Just drop me a line."

—Agricola "Supreme"  
LEADER OF FURNACES

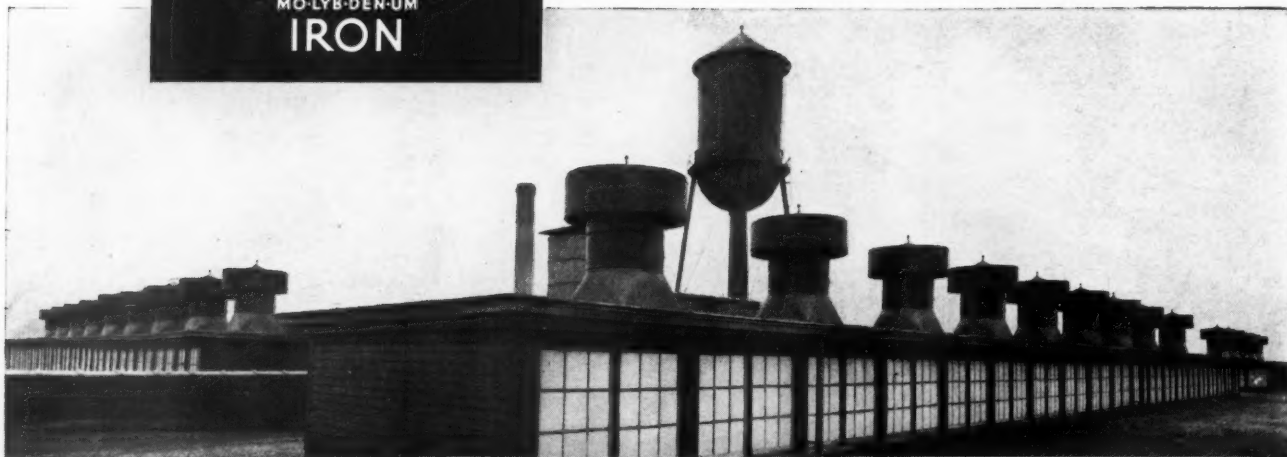


"FURNACE WARMTH  
FROM THE SUNNY SOUTH"

**AGRICOLA FURNACE CO., Inc.**

**Gadsden, Alabama**

*Offices in Principal Cities*



## AN OUTSTANDING INSTALLATION OF BURT VENTILATORS



Twenty-three 48-inch Burt Direct Connected Fan Ventilators keep a steady stream of fresh air moving through the St. Louis plant of the National Lamp Works; Division of the General Electric Company.

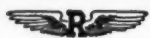
Every one of these ventilators is made of Toncan Iron, and this is only one of many Burt Installations, where Toncan Iron is daily proving its economy in service—its resistance to rust under the combined attack of atmospheric moisture and plant gases in the exhausted air, as well as the action of the elements.

Toncan Iron is an alloy of refined iron, copper and molybdenum. It resists rust to a higher degree than any other ferrous metal except stainless steel. It possesses wonderful fabricating qualities. And it helps make sales for sheet metal workers because the name Toncan has been advertised extensively for years.

Toncan Iron builds good will, cuts fabricating costs and helps the sheet metal worker to obtain better work at a profit. "The Path to Permanence," tells the whole story. Ask for a copy.

# REPUBLIC STEEL CORPORATION

GENERAL OFFICES



YOUNGSTOWN, OHIO

# MONCRIEF GAS FURNACE

A newly designed gas furnace of high heating ability to sell at a price that opens up a wide market. The cast iron heating units with long gas travel afford unusual efficiency and economy. May be equipped with all automatic air conditioning devices.



Series "B"

## You Can Sell These Furnaces

**T**HE Moncrief line of gas and coal furnaces present the alert dealer everything he can ask for in selling points. They are quality made to render long efficient service; and priced so he can successfully meet competition from every angle.

You can make money with the Moncrief line. Send for particulars.

**THE HENRY FURNACE & FOUNDRY CO.**  
3471 East 49th Street Cleveland, Ohio



Series "C"

# MONCRIEF FURNACES

CAST STEEL  
ALL TYPES AND SIZES  
COAL GAS

*Branches at Pittsburgh, Pa., and Ashtabula, Ohio*

Eastern Office

2134 Market St., Philadelphia, Penn., E. L. GARNER, Mgr.

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McPHERSON FURNACE & EQUIPMENT CO., Seattle, Wash.

### Distributors:

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Moncrief Furnace Co., Indianapolis, Ind.  
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Johnson Furnace Co., Kansas City, Mo.  
E. A. Higgins Co., Omaha, Nebr.  
J. M. & L. A. Osborn Co., Buffalo, N. Y.  
Wilkes-Barre Hardware & Stove Co., Wilkes-Barre, Pa.  
Springfield Plumbing Supply Co., Springfield, Mass.

Geo. H. Cole Supply Co., Troy, N. Y.  
E. W. Burbank Seed Co., Portland, Me.  
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Moncrief Heating Co., South Bend, Ind.  
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We supply a full line of  
pipes and fittings, every-  
thing used on a warm air  
heating job.

**SHOOTING  
AIR  
FROM  
GUNS**

**To Every  
Room in  
the House  
without a  
Booster  
Fan..**

**50%**

More Air Thru Heat Pipes.

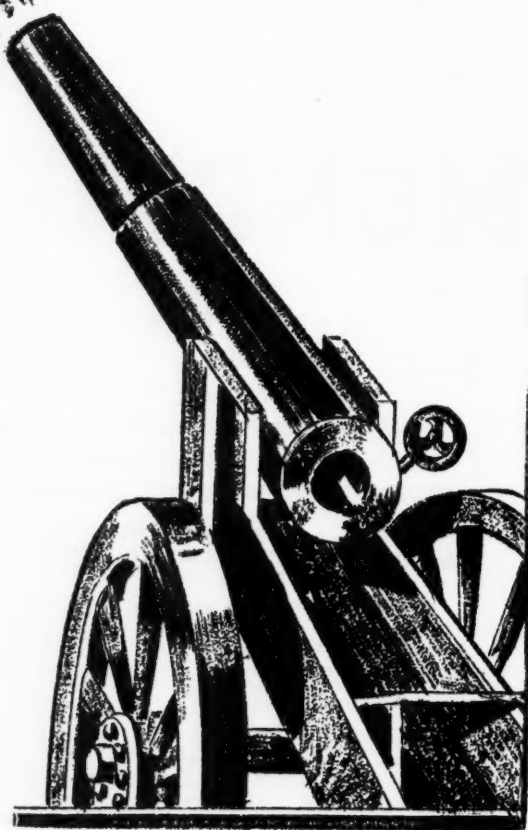
Here, Mr. Furnace Dealer, is  
the outstanding warm air heater  
of today.

A heater that will outperform any  
furnace made.

It's as far ahead in performance as  
the automobile was to the horse and  
buggy. The prices are right.

Furnaces are now in process of  
production and ready for shipment  
April 15th.

We'll tell you more about it in the  
next issue.



## Chins Out!

**D**ID you ever wonder why fighting men from time immemorial have been pictured as individuals with a jutting chin, squinted eyes and firmly compressed mouth?

This characterization of the fighter has a sound basis—the fact that a man can't fight until he clamps his jaws shut, concentrates his sight and sucks in his breath preparatory to unleashing his pent-up fury.

Now, it's perfectly true that we can't all make over our physiognomy, but just for the moment try clamping shut your mouth, squinting your eyes and sucking in your breath. Automatically your mind concentrates on some problem, some hatred, some special effort which you want to see succeed.

What the warm air furnace and sheet metal industries need is a whole lot more of this elementary practice in concentrated effort.

We have been listening to a whole lot of pessimism which isn't helping business. Then why not—instead of sitting still and bemoaning fate—clamp your jaws, squint your eyes and suck in your breath while you think of how you are going to get some business into the shop.

You want business. Where to get it and how is the problem. There must be some business, for most of us are still at the old stand. Having gone this far, why not fight for better business during the rest of this year.

Consider for the moment what we may expect to happen during the next few months.

People all over the country are going to ask about heating and cooling. Most of them think they want to buy a REAL air conditioning system when they won't buy more than a few degrees of conditioning.

But do we care? It's our business to sell a man as much as he can afford to buy. And no matter how little that is, it will be much better than the equipment he now has.

We know, if the buyer doesn't, that a new furnace, with modern improvements, is a better and more efficient heating plant than the furnace the owner has been using for the last ten years.

We know, if the buyer doesn't, that a rightly installed warm air heating plant will give more comfort, more health, more satisfaction than any competitive type on the market.

We know, if the buyer doesn't, that the installation

of a filter will make the air in his home better for his family and reduce the constant fight against dirt which makes his wife cranky.

We know, if the buyer doesn't, that a fan or a blower to constantly change the air inside his house will make rooms more comfortable even though it doesn't decrease the temperature or lower the humidity.

We know, if the buyer doesn't, that simple gravity ventilation can work wonders with those second floor sleeping rooms and give the owner eight hours sleep—in a bed.

We know, if the buyer doesn't, that a low-priced cabinet in which he can place ice at not over \$1.00 a day will give a cooling system which he will brag about all over the neighborhood.

We know, if the buyer doesn't, that when it comes to air conditioning we can give him just as much as his purse will stand and that regardless of other industry's sales talk, warm air is, after all, the true conditioning system.

We know, if the buyer doesn't, that many of the repairs needed on his roof have gone so long that any rain is apt to ruin his furnishings and that our shop can, for a small sum, give positive insurance against such damage.

We know, if the buyer doesn't, that we can save him money by taking all the dirt and soot out of his furnace so that when next fall's fires are started all the heat in the fuel will serve to warm the house.

These services, which any one of us can offer, are all small contract jobs. No one of them will cost as much as an automobile overhaul, or certainly not as much as that new car at which the home owner is casting ogle eyes.

Perhaps the trouble is we haven't yet clamped shut the jaw, squinted up the eyes, sucked in the breath and pushed the owner's door bell so full of unleashed energy that the owner can't keep us out. Perhaps we haven't been quite concerned enough over that last turndown or that last lost sale that we pound the buyer so hard he can't say NO.

No matter how much we hate to get off the back of our laps, we can't get away from the fact that all sales do not go to the man with the lowest price and that in the long run the fighter is the man who is going to be on top when the final decision is turned in.



The new home of the Virginia Department of Public Works has outside and inside walls of aluminum sheets with the  $3\frac{1}{2}$ -inch space filled with insulating material

# First All-Metal Office Building Employs Ingenious Fabrication

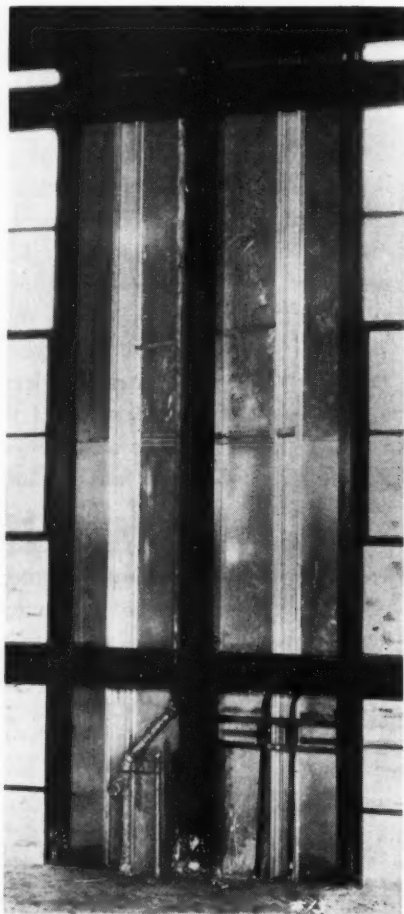
By JAMES BOLTON

*Chief, Bureau of Surveys and Designs, Department of Public Works, Richmond, Va.*

THE first all-metal office building to be erected in this country has recently been completed in Richmond, Virginia. Graceful in its simplicity, this building has taken its place in historic surroundings as a true interpretation of modernity without destroying the beauty and dignity of the past. It shows in a very positive way the many creative things that the future holds for architecture and points to a more generous use of metal in building construction.

The building is the new home of the Department of Public Works. It is a two-story structure, rectangular in shape, with a frontage of 116 feet and a depth of 50 feet. Metal predominates on both the interior and exterior surfaces above the first floor level, the basement being of customary masonry construction.

In planning this building the architects turned to metal because of certain definite economies resulting



from its use. Based on sound engineering principles, the application of metal, employing, as it does, new forms and materials, has eliminated heavy curtain walls, reduced column and girder size, speeded up erection and made possible the occupancy of the building in a much shorter period of time.

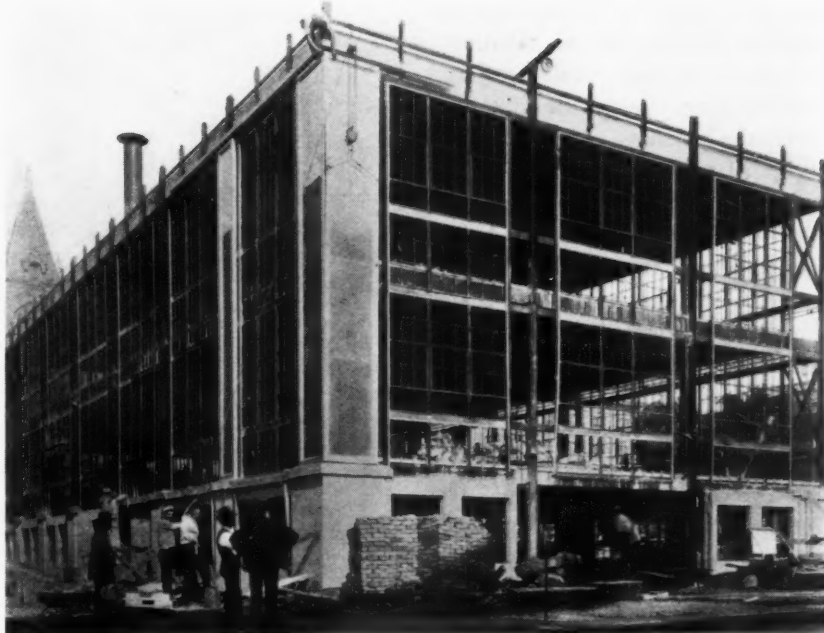
The inner and outer walls of the building are fabricated from aluminum. In the outer walls, plate and extruded shapes are used, the latter being employed to produce a drop-panel effect in the pilasters and entablature and give the building a firm architectural character. The inner walls are formed from sheet with insulating material pumped into the intervening space between the outer and inner walls.

Steel casement windows extend

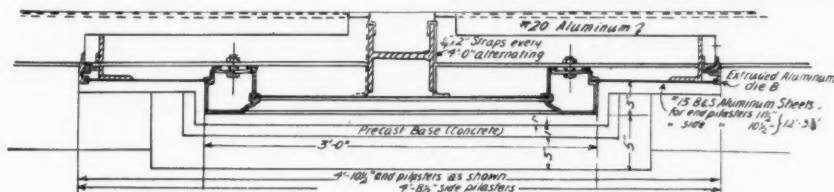
Aluminum plates, jointed horizontally, form the pilasters. Backing sheets, similarly applied, form an air space later filled with insulation

from the first floor level to the base of the entablature and form a continuous line between the pilaster columns. The spandrel areas of the windows are backed with aluminum sheet and insulated in a similar manner to that employed elsewhere in the walls.

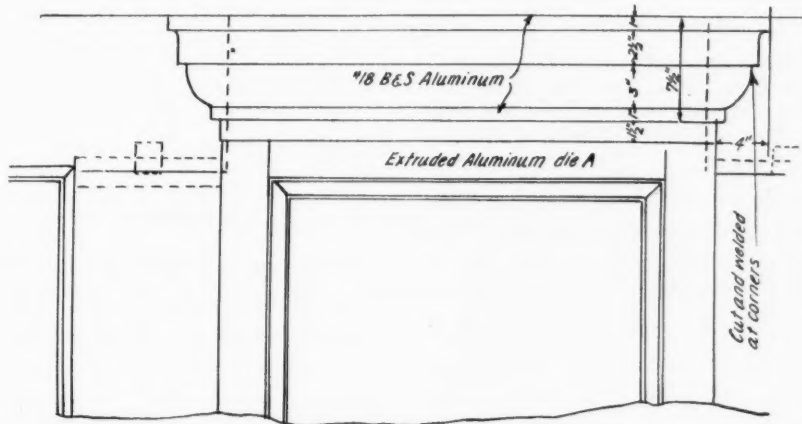
A pleasing contrast in color and texture is obtained on the exterior of the building by giving the pilasters and entablature a sand blasted finish, and the light metal trim on the windows and between the window frames and pilasters, a satin finish. To accentuate this contrast even further, the window frames are painted black except in the spandrel sections; here, both the window panes and frames are painted with aluminum paint.



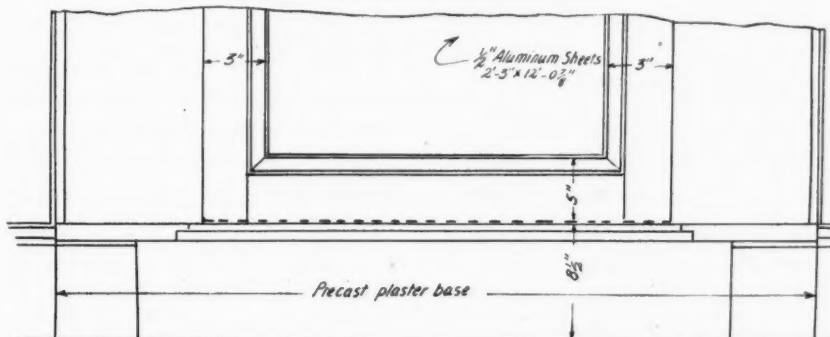
Assembling an end pilaster. Note that an entire face—moldings, cornice and back were welded in the shop. The full pilaster—2 stories high—is being placed



This cross-section shows the construction of a pilaster. Both extruded and formed plates are used. The structural frame is ingeniously devised to hold the metal wall



Above is an elevation at the top of the pilaster. All sections were field or shop welded to insure tight construction



The pilasters rest on precast concrete bases. These walls weigh only 10 pounds to the square foot—a remarkable weight saving

### Decorative Effects

The entrance to the building, including doors and door jambs, is done in satin finished aluminum; while the name of the building, formed from aluminum sheet and dyed black, stands out in bold relief on the spandrel section above the entrance. And in keeping with this aluminum and black decorative effect, the ornamental iron railing and light standards on each side of the concrete entrance steps are painted black.

The partitions on the first and second floors are of satin finished aluminum sheet over wooden frames. The permanent partitions at the entrance extend to the ceiling, while those between the structural bays extend only to within 3 feet of the ceiling, thus providing better ventilation for the offices. The ceilings are of plaster applied on metal laths; the floor covering of  $\frac{1}{8}$ -inch asphaltic tile.

### Structural Frame

The entire structure is assembled on a structural steel framework, which, in the true sense of the word, is a skeleton framework, in

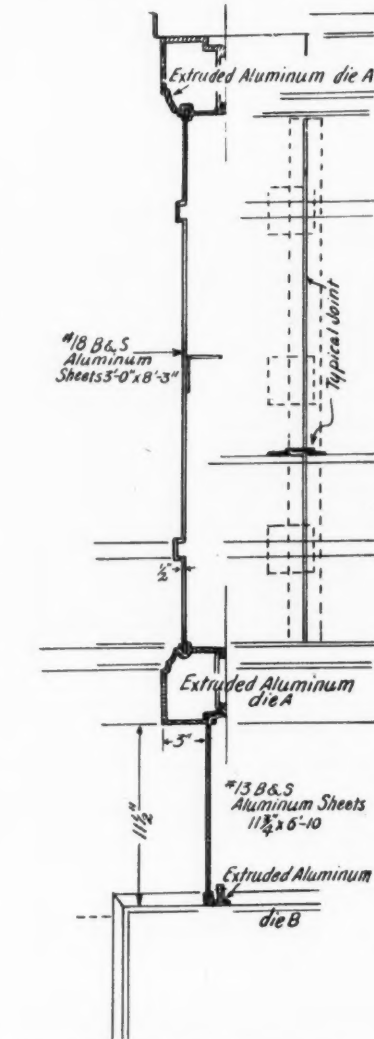
that its weight has been materially reduced by the use of aluminum curtain walls and steel floor and roof decking. Below the first floor level, the columns consist of 8x8-inch, 31-pound H's; above this point, of 6x6-inch, 20-pound H's. Twelve-inch channels and I-beams are employed for the floor girders and 10-inch channels and I-beams for the roof girders; both the floor and roof girders extend in one direction only. Each structural bay is 16 feet 6 inches by 16 feet 8 inches. The concrete footings, upon which the columns rest, are 4½ feet square and extend to compacted clay gravel only 18 inches below the basement floor level.

Lattice type joists, bolted at the top and bottom to the structural girders, are used for both the floor and roof beams; while formed steel plate, attached to the joists by means of bolts, serves as the floor and roof decking. The roof is covered with 5-ply slag roofing on insulated boards cemented to the steel decking; the floor with 3 inches of gypsum, poured in place and unreinforced. As constructed, the floors have a live load of 80 pounds per square foot and a dead load of 20 pounds per square foot; the roof is designed for a live load of 30 pounds per square foot and a dead load of 15 pounds per square foot.

### Weight Saving

The saving in weight made possible by the use of aluminum curtain walls is even greater. For years the structural framework of buildings has been loaded down with tons of masonry, thus necessitating heavier columns and girders. But with the development of metals and alloys which possess a reasonable freedom from attack by the elements and which do not require excessive maintenance, a decided reduction can be made in not only the weight but the thickness of the walls.

In the new building of the Department of Public Works, the facades are from 3½ to 7 inches thick; they, together with the in-



Cross-section of the cornice above a window. Note how the same die was reversed to give both top and bottom molding

insulating material, average less than 10 pounds to the square foot. The basement walls of concrete offer a good comparison; these are 10 inches thick and weigh approximately 120 pounds per square foot. Tests on double metal walls of the type used in this structure have shown that the 3½-inch walls have the equivalent insulating value of 48-inch brick walls.

### Fabrication

The metal fabrication was worked out so that field erection was greatly simplified. For example, the pilasters, whose formation is shown on one of the details, were so formed that an entire pilaster was erected as a unit. The photographs also show how these pilasters were formed in long sections with side

frames, moldings and back plate all seamed or welded together. One of the cross-sections shows how the molding and side strips are extruded shapes with a slotted inner edge to take the back plate. This cross-section also shows how the same die was used to form both extruded panels.

The inside wall, made of aluminum sheets, is likewise shown in this cross-section. The construction of the wall is such that the outside and inside wall form a hollow shell, later filled with insulating material. The steel work was especially designed to make this construction possible. Suitable clips and bolting lugs were provided so that erection of the sheets was made without special blocking.

Around the top of the exterior walls there is a wide cornice, or parapet, with a cross-section as shown on one of the details. Two die-formed, extruded shapes form the upper and lower molding of the cornice with sheets placed in slots provided in the shapes. The panel between these two moldings is further ornamented with two square-faced ribs which run the full length of the cornice.

The sections were clipped and locked as shown in the cornice detail.

### Spandrels

Two types of spandrels are used—small panels under the second story windows and larger panels at the first floor. The exterior photograph shows their appearance. These spandrels are really backing sheets applied behind the steel casements. An inner wall sheet similar in application to the inner wall of the pilasters is used and the space between the sheets is likewise filled with insulation.

Due to the close co-operation of all the parties interested in the design and erection of the building much waste effort and expense was eliminated through the use of simple and repeated forms for the metal sections. This is shown by

(Continued on page 26)



Eighty per cent of these houses have a furnace (or a boiler) which will work more efficiently if it is cleaned this spring. The owners of these homes are your prospects for a cleaning campaign. How to make these prospects your customers is the purpose of this program.

# A Cleaning Campaign —for Profit!

You probably have tried furnace cleaning. Most furnace dealers have.

If you have followed a sound plan, carefully devised and considered before you began your solicitation, *and have asked a legitimate price*, you have made money.

If you have tried to sell cleaning at a low price and have depended upon repair and replacements for your profit, you have done a lot of cleaning at a loss.

Perhaps you will say, "True enough, but in my town I can't get that kind of a price."

The answer is, If you can't make a profit, why clean?

The trouble is, you are not offering the

type of cleaning service which owners are willing to pay a good price for.

People are not fools. They know, just as well as you do, that if they buy a \$1.00 cleaning job they will get just \$1.00 worth of service and not a cent more. And say what you will, the \$1.00 job is *not* the kind of cleaning service they want.

We all know that coal dealers are offering free cleaning if you buy your coal from them. We all know, too, that ex-mechanics are doing cleaning at prices we can't meet. If you meet these prices you are playing their game and placing your service on a par with theirs.

There's no money for the legitimate dealer in this battle.

Nevertheless, there *is* money to be made in cleaning. Hundreds of furnace men, in big towns and little towns, are making good profits from their cleaning campaigns. If they can make money, why can't we all? We can—providing we take the ideas they are using and build them into a campaign applicable to our communities.

This is the general idea behind this series

of articles—a *cleaning campaign for profit*.

We take no credit for devising this campaign. The plan is, in fact, a composite of many campaigns conducted by contractors who have made money in cleaning. The ideas are theirs. The plan of operation is theirs. The things suggested as likely to happen, as well as the things to be avoided, all come from these contractors who have been through the mill. There follows the first article of the series—Prospecting and Prices.

## Setting the Price and Getting the Prospects

**W**E'RE going into this "cleaning game."

We've heard a lot about it, probably more from dealers who swear AT it than from dealers who swear BY it. Nevertheless, work is slack in our shop and there doesn't seem to be many jobs in prospect, so we have determined to get out and solicit business. Of all the services we have investigated, cleaning furnaces seems to offer the best possibilities.

What do we need?

First of all we need a plan. Something to work to which will regulate our solicitation efforts. So let's sit down and see just what we ought to do.

Right at the start let's see where the profit comes in. That's important, because if we can't make a profit, why wear out shoe leather or nerves just to lose money?

### Where Are the Profits?

Profits from cleaning come from two sources. First, there is the direct profit which will come from the cleaning service. Second, there will be a profit on all the repair work and all the replacements we will dig up as a result of our cleaning work. We can see right here that these secondary profits are going to be much bigger, individually, than the two or three dollars profit which we will get from cleaning.

"In that case," we say to ourselves, "let's do our cleaning to get

repairs. Then we can lower our price to compete with the coal men and still come out in the black."

But that is exactly what hundreds of other dealers before us thought and has caused more lost profits than all the other sources of grief combined.

### Setting the Price

Which brings us to the consideration of price. How much shall we ask? How much can we get? How much margin will it leave us? And after we set our price—**WILL WE MAKE OR LOSE MONEY?**

This matter of price is the crux of the cleaning situation. When cleaning was a new idea most contractors were able to get from \$10.00 to \$15.00 for a cleaning job. Then as orders became more difficult to get and every Tom, Dick and Harry started cleaning, prices dropped and dropped, until today there are many towns where you can get your furnace cleaned for \$1.00, or even free if you will buy your coal or your lumber from some dealer in these products.

No matter how much you want to do cleaning, you can't compete with these \$1.00 shops unless you want to give away your time and money. So long as ex-mechanics can get a cleaner for a little down and a little now and then, the cleaning business is going to be overrun with cleaning propositions by men willing to work out of their home garage for a day's wages.

There is little use in our starting a cleaning campaign if we fail to consider that this situation exists and our campaign is worthless unless it recognizes that \$1.00 cleaning is with us and probably will be for a long time.

If we can't meet low price, what shall we do? The answer is—plan a service which is worth a fair price to the home owner. That it can be done is proved by contractors all over the country who hold their price in spite of competition.

Of course most of these contractors do not clean *hundreds* of furnaces every year. They didn't expect to when they set their price, but they do expect to **MAKE A PROFIT ON EVERY JOB, WHETHER THEY SELL REPAIRS OR NOT.**

A survey by **AMERICAN ARTISAN** reveals that in practically every case these profit campaigns are based on two ideas.

1. Cleaning is sold on the basis of giving the owner a **SATISFACTORY** job—guaranteed. And the service includes those little things which please the owner, but which cost the dealer only a small sum.
2. These contractors sell the idea of having cleaning done by a **REPUTABLE** contractor, by a **RECOGNIZED** business man, by a **TAX-PAYER**, by an established **EMPLOYER** of labor, by a man with a **FINANCIAL**

**RESPONSIBILITY.** In short, these contractors fight the \$1.00 cleaner with REPUTATION.

What is a fair price? In answer to numerous letters and personal interviews, a price between \$7.50 and \$15.00 has been suggested as sufficient to make a profit. We realize very well that between \$7.50 and \$15.00 there is a wide spread. But in this spread lies the answer to the question—HOW MUCH CAN I GIVE FOR THE PRICE I ASK?

### Price Your Service

Just where between these two ranges you will set your price depends upon:

1. Cost of labor;
2. Radius you expect to cover from your place of business;
3. Your shop's overhead cost;
4. Just what you expect to give.

AMERICAN ARTISAN's campaign will be based upon a price of \$10.00 per cleaning job?

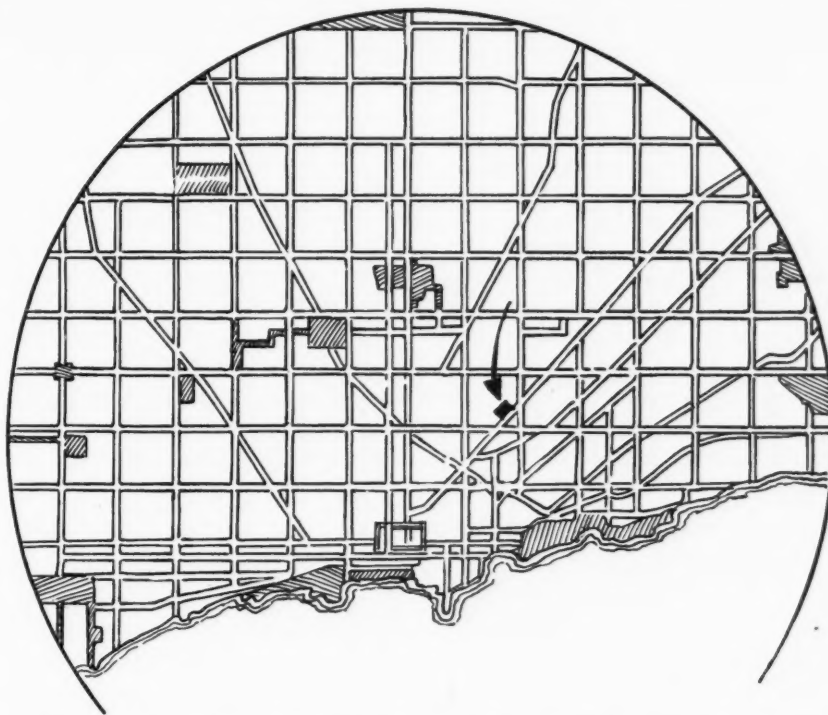
**WHAT CAN YOU GIVE FOR \$10.00?**

1. We will consider that you pay your mechanic \$0.90 per hour. It should take three hours to do an average job. Your labor cost will be \$2.70.

2. We will say that your area of effort will be a circle not over 10 miles from your shop. You will ship your cleaner or your tools to the job in a small truck. If you build your volume to the point where you will do a minimum of two jobs a day, you will figure your truck costs at \$2.00 a day or \$1.00 for each job.

3. The cost of getting cleaning orders should not be over \$1.00 per job. This is based upon a fair return from direct mail efforts or not over \$1.00 per job for leads turned in by home owners, mechanics or house to house canvassers.

4. If you classify your overhead into departments and do not let cleaning carry the entire shop overhead, the overhead allotted to cleaning should not be more than \$0.50 per cleaning order. If your over-



There is a limit to the area which you can cover profitably from your shop. When you plan your campaign, get a map and mark this area on it. Every owner inside that circle then becomes a profitable customer

head has to run higher, then you must raise your price per job.

5. In this three-hour job you should be able to do the following labor items:

1. Clean out the radiator and the combustion chamber;
2. Clean off all loose dust and dirt from the warm air leaders;
3. Paint the front of the furnace;
4. Clean out the returns as far back as the hose of your cleaner or your rake will reach. If most of the returns in your community are wood faces which are hard to take out, then you must increase your time allotment and also your price.
5. Clean out the base of the chimney, but not the chimney above the basement floor;
5. Clean out the register boxes in the average house;
6. Fill in the inspection card for future use;
7. Clean up your muss.

### Make Your Plan Complete

It is highly important to eliminate all items from this list which

your local conditions will not permit you to do within the cost established, or add such items as you can within your price.

The important thing is to definitely establish just what you expect to do.

By doing this you will be able to explain your service in a few words either at the owner's door or in your newspaper advertisements or direct mail literature.

When you have your campaign all laid out on paper the next problem is, WHERE SHALL I DIG UP MY PROSPECTS?

### Getting Prospects

Getting prospects for cleaning is a long and arduous job. But a good prospect list is worth all the time and effort you can spend on it. In fact, aggressive merchandisers treasure their prospect list as the most important asset of their business, for upon prospects rests future business and profits.

If you have been conscious of the importance of prospects, you already have quite a file of names and addresses and data in your office. However, we will presume that you have never used a pros-

pect list and must build your cleaning list from the ground up.

#### HOW SHALL WE BEGIN?

Remember that the thing you are after is NAMES AND ADDRESSES OF PROPERTY OWNERS.

The first persons you should consider are your OLD CUSTOMERS. These people are on your books. You have done work for them and if you do good work they will remember you favorably. If your work hasn't been satisfactory—well, we might as well forget this, because you won't be in business very long. These old customers should remember you and your work. They are easy to approach because you can refresh their memories directly and favorably.

So, your first list is the people who have used your services in the past. Their names should be taken from your books and placed on your prospect list together with addresses and telephone numbers.

Let us try as your second place

to go for names—the tax lists of your community. Usually such lists are kept in tax books. To get the information you want you will have to know just how each particular section of your city is designated. Call for the proper book and copy out names and addresses. The information you want most is the names of HOME OWNERS.

The third place to get names is from local credit agencies. If these organizations will give out names, you not only have the name and address, but also an idea of the owner's willingness to pay.

As a fourth place to get names, try your poll books if you can check these names against property lists. Names of persons who do not own property are of little use.

Fifth, your telephone directory. You may be able to save time by buying lists which are classified by location or by ownership from some listing agency. If such lists are not purchasable, make a list of the streets you want to work, then go

through the directory and write out the names on these streets. Fill in the correct spelling and initials and the address and phone number. You will now have to find out whether these persons own or rent. This brings you back to your tax list.

Sixth, your city directory. This lists names alphabetically and in some directories by street addresses. If names are listed by location, take off these names and then find whether the name is of an owner or a renter.

Miscellaneous lists can be obtained from chamber of commerce listings, club and church directories, occupational listings, newspaper surveys of home owners, lodge memberships, social club lists, and items from local papers, etc.

The value of names contained in this last classification is that they appear from day to day and can be checked against your existing lists, once your file is started.

KEEP YOUR LISTS UP TO DATE DAY BY DAY.

**This first article outlining the Cleaning Campaign for Profit covers ground which most contractors have been over. However, if your solicitation plan has not considered these factors—if your prospect list is a hit-or-miss affair—or you haven't tried to list every prospect so that you can get to him quickly and easily—then your return average will be low. The articles to follow will outline a definite program of direct mail literature, individually addressed letters to home owners and newspaper advertising. There will also be stories on specific campaigns as reported by contractors. Anyone wishing to use this material before it is published should write to American Artisan.    ✓    ✓    ✓    The Editor**

# A "Checking System" for Costs

SO much has been written concerning overhead costs and so many people resent any idea of a suggested change in their methods of figuring costs, the writer offers a suggested checking system for shop men to check their cost methods.

Time is the all important basis of cost, so we will use a time base. Ordinarily, the average time is taken from the work, while overhead costs are figured by the year's business. To properly determine the easiest method, we will say that time equals 40 hours per week. For the year we have 40 times 52, or 2,080 hours of work. This divided into fixed overhead will give a rate of overhead cost per hour. This computation is shown in Table I.

Another method is to divide annual hours time into \$1.00, which gives the hourly rate, thus: 2,080 hours divided into \$1.00 equals .00048c per hour for each dollar of overhead costs. Assuming an annual overhead cost of \$3,000.00, the rate per hour for overhead would be \$3,000.00 multiplied by .00048c or \$1.4424. The problem now is to develop an hourly business average. This is the point where good judgment must be used and much depends on sales ability. If the business has been a going concern for a number of years, the hours can be averaged fairly well. A new business, not having prior experiences to draw from, should use average weekly estimates until such time as a fair yearly average can be found.

Let us assume we will spend \$300 for the first week. We now develop our rate. For 40 hours at \$1.4424 per hour we have \$57.70 as our overhead cost for the week. This equals 19.24% of the dollars spent—\$300. Then we have:

Cost .....	\$300.00
Overhead, 40 hours @ \$1.4424 .....	57.70
<b>Total Cost.....</b>	<b>\$357.70</b>

**By C. M. CASE**  
*Niagara Falls, New York*

To this \$357.70 should be added such a sum as will show a sale price of at least 20% profit. Then 100% minus 20% equals 80%. \$357.70 divided by 80 and multiplied by 100 equals selling price of \$447.13. Proof 20% of \$447.13 equals \$89.43 profit. Then—

Selling Price.....	\$447.13
Cost .....	\$300.00
Overhead .....	57.70

**Total Cost..... \$357.70**

**Profit ..... \$ 89.43**

This rate—19.24%—if applied to labor at \$1.25 per hour would be .2405c per hour. Rate \$1.25 plus .2405c for overhead equals \$1.4905 per hour for cost. Figured at 80% of Selling Price, we have \$1.863 for the selling price for each hour. Proof is—

Labor—240 hours @ \$1.25 per hour .....	\$300.00
Overhead—240 hours @ .2405c per hour .....	57.70
<b>Profit @ 20% of Selling Price .....</b>	<b>89.43</b>

**Selling Price.....\$447.13**

Table I shows two shops. The figures are arbitrary but are given to illustrate how salesmanship and large volume will permit large shops to compete with small shops. The table also shows that idle equipment must be put to work to lower overhead cost. The rate on every dollar of load charge is .00048c per hour, and idle equipment costing \$1,000.00, at 6% equals \$60.00 per year, or \$60.00 times .00048c per hour equals .0288c per hour actual cost.

The problem, then, is to sell both labor and merchandise at your base rate and keep your costs up-to-date.

**TABLE I**

<b>Shop A—Investment \$40,000.00</b>	
<b>Overhead:</b>	
Interest @ 6%.....	\$2,400.00
Depreciation .....	350.00

Taxes .....	160.00
2 Trucks Operated.....	700.00
Light and Power.....	240.00
Insurance .....	500.00
Fuel and Water.....	250.00
Other Expenses .....	260.00

**Total Overhead .....\$4,860.00**

**Average 16 men employed.**

16 times 2080 equals 33,280 hours for year. 33,280 hours divided into \$4,860.00 overhead equals .1463c per hour for overhead.

**Shop B—Investment \$1,200.00**

**Overhead:**

Interest @ 6%.....	\$ 72.00
Depreciation .....	60.00
1 Truck Operated.....	350.00
Light and Power.....	36.00
Fuel .....	35.00
Insurance .....	125.00
Other Expense .....	75.00

**Total Overhead .....\$ 753.00**

**Average 2 men employed.**

2 times 2080 equals 4160 hours for year. 4160 hours divided into \$753.00 overhead equals .1810c per hour for overhead.

**J. G. Dingle looked this letter over and says—**

The letter from a shop owner giving his idea of a means of loading overhead on productive hours is a plan which has some very good points, particularly in such shops as use productive labor as an overhead base.

The estimating of productive hours for the year may be as accurately done as is the prediction of sales volume or any other estimated base used in spreading annual overhead. I do not believe it safe to use 40 hours per week for 52 weeks for each man employed. This contemplates a five-day week—for the full year, which can rarely be maintained. Further, no allowance is made for holidays, non-productive hours, and the many interruptions that occur. For a shop where the proprietor does productive work, and keeps, say, one man, I would

(Continued on page 46)

# FAN BLAST ENGINEERING

by P L A T T E  
ENGINEERING



O V E R T O N  
EDITOR . . . .

## Where and What Is Friction? [Part II]

**F**RICITION varies according to the kind of material used in the construction of air ducts. We can prove that friction losses are due to the friction of the air against the side of the duct, by passing our hand firmly over such materials as concrete, wood, brick, or sheet steel to observe the variation in friction.

An investigation of the various textbooks on such resistances gives us factors from .0000000056 to .00028. Such factors are unwieldy. Some authorities have devised formulas wherein such factors may be used as: 60 for smooth pipe, 50 for ventilation ducts, 45 for smooth and 40 for rough ducts of tile, brick or concrete.

### Resistance Formula

As the formulas wherein these simple factors are found are also rather complicated, we will pass them up at this time and use an old empirical formula found in textbooks of some years ago. We will use this formula because it is about as simple as we can find and will help us visualize our friction loss difference between sheet iron and concrete ducts as applied to a given problem.

$$\text{This formula is } P = \frac{K \cdot S \cdot V^2}{A}$$

Where P = Loss in inches of water.  
K = Construction of duct.  
S = Friction inside in sq. ft.  
V<sup>2</sup> = Velocity in ft. per sec.  
A = Area of duct in sq. in.

The factor "K" may be set at

0.0002 for galvanized iron; 0.00028 for concrete.

Let us assume that we have a duct 100 feet long, 2 feet square, with a velocity of 1500 feet per minute. Our duct in this case will be of galvanized iron. Our formula then becomes

$$P = \frac{K \cdot S \cdot V^2}{A} = \frac{.0002 \times (8 \times 100) \times \left(\frac{1500}{60}\right)^2 \text{ squared}}{24 \times 24} = \frac{.0002 \times 800 \times (25)^2}{576} = \frac{.0002 \times 800 \times 625}{576} = .173$$

resistance in inches of water.

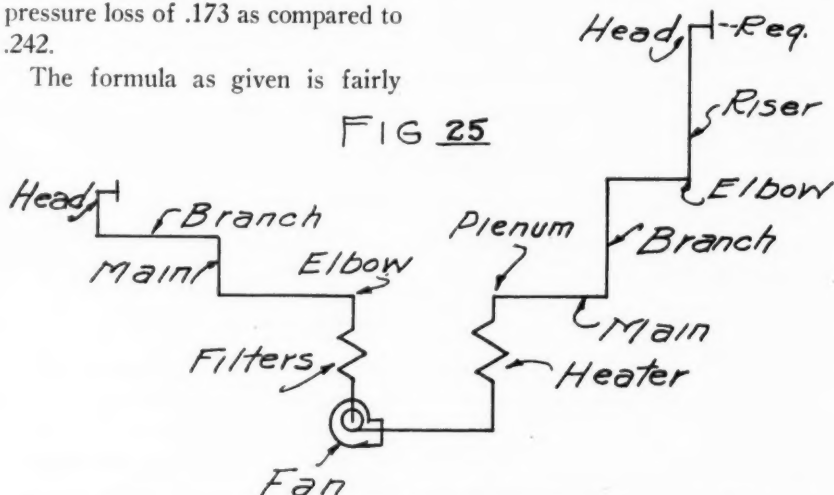
We will now apply the same formula to a duct of concrete construction and we have

$$\frac{.00028 \times 800 \times 625}{576} = .242 \text{ inches of water loss.}$$

Thus we have a difference of pressure loss of .173 as compared to .242.

The formula as given is fairly

FIG 25



Losses occur whenever a column of air changes direction or velocity. On this system, which is quite ordinary, there are 15 places where "loss" occurs. This shows the importance of knowing and providing for "loss"

accurate and checks up reasonably with the friction chart.

Friction also varies according to the humidity and temperature.

### "Standard" Air

We note that on charts and graphs, also on capacity tables in fan catalogs, that we see this note: "Based on air at 70° F.—29.9 Hg.," or "Based on dry air at 70° F.—29.92 Hg." We sometimes see the expression "standard air" and this refers to dry air at 70° F.—29.92 Hg. 29.92 Hg. means 29.92 inches of mercury and is the barometric pressure for standard conditions. Such conditions are generally noted at the place where the fan is tested. Now if our fan is to handle air at say, 135 degrees, the fan catalog rating would not apply, or if the fan were to be installed on top of a mountain 2 miles high where the barometric pressure was much

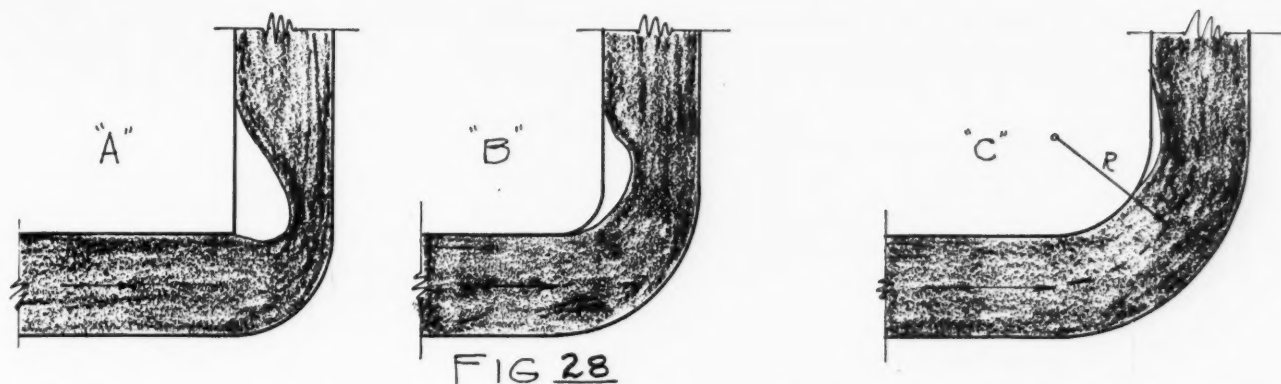


FIG 28

If you have wondered what happens to air at elbows, here is a drawing showing what happens at three usual elbows. Long radius turns should be specified

lower than 29.92 inches of mercury, the ratings would not apply.

Let us say that air saturated with steam from a washing vat is to be handled by the fan. Here again the ratings must be changed. These items, while of interest, are merely given at this time to prove that friction varies according to the humidity and temperature.

Now that we know that friction varies, we might ask the question: Why? Let us first consider the temperature. Authorities state that the viscosity of air increases slightly with increased temperature and hence increases the friction loss. Such increase is small and in conventional forced air heating systems where the air varies from 65 to 150 degrees this difference may be disregarded.

#### Effect of Moisture

Humidity or the vapor content of the air will have an effect on the velocity, consequently will affect the pressure loss. Here again the factors involved are small, unless the extreme conditions are encountered or large volumes of air are used.

The foregoing paragraphs are of interest and we know that humidity

and temperature will affect friction to some extent. This effect as stated may be overlooked or disregarded, but such items as duct construction, shape, area, elbows, and branch take-offs are highly important and items that no designer of duct systems can afford to overlook.

Elbows, turbulence, shocks, and counteracting currents of air, cannot be entirely eliminated, but they

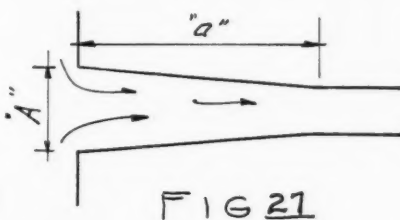


FIG 21

This shows a better main "takeoff" from the plenum; make "a" three times the dimension "A" for good design

can be reduced to the minimum by careful design.

Fig. 25 is a graphic picture of "losses" encountered in the average forced air system. We have here 15 places where actual turbulence, shock, and change of velocity take place.

Here are fifteen chances to go wrong. Fifteen places to make a mistake. Just one serious miscalculation may make 14 correct estimates null and void. One elbow may effect the air delivery to one room or several rooms.

A glance at Fig. 25 may give the reader an "inkle" regarding the insistent harping of the writer on "designing trunk lines to resistance," "designing entire system to precalculated pressure loss," etc.

Such methods compel the designer to study every item involved from the grille or register on the wall to the type of belt drive on the fan. Such a designer "proportions" his losses throughout the system. If conditions force him to install one elbow with an abnormally high velocity head loss, this should affect all the balance of the system and possibly change the entire design.

The "guesstimator" who guessed at the duct sizes and on the day of the test goes about wildly throwing volume dampers, may get by. Again he may not. There is ample proof of many failures.

#### Where Losses Occur

For our various losses we will start with the plenum chamber, figure 26. Our loss here will be approximately .47% of the velocity head (see article AMERICAN ARTISAN, March 14). If due to many additional losses on the line, the available velocity head is low. Fig. 27 is an improvement over Fig. 26. Here the dimension "a" should be three times the dimension "A." Such a fitting as Fig. 27 may reduce the loss to 25% of the velocity head. This fitting is termed a converging nozzle.

Our next encountered loss is an elbow. Fig. 28 shows three types of elbows. Our choice here for good design is obviously elbow "C." Here the radius R should be 125% of the duct width. Such long, easy-curve elbows will vary from 15 to 20% of the velocity head loss. Elbow "A" will have a loss of .75 of the velocity head.

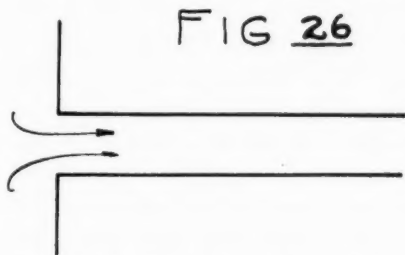


FIG 26

Check the loss at the plenum as shown here with the article on "velocity head" in the March 28 issue



In this factory warm air is introduced in order to pick up process vapor. The vapor-laden air is exhausted by monitor fans

**T**HE proper and adequate removal of vapor (usually steam) is a problem almost as varied as industrial activity. To name a few of the processes which are benefited by vapor removal we can cite laundries, dye houses, tanneries, leather plants, paper mills, etc. All these industries, which differ in the products manufactured, have one common trouble—too much moisture from vats, machines and open-topped processes.

This field is so diversified that sheet metal contractors everywhere should be able to find prospective

work near at hand. For instance, in the dye industry there are several thousand establishments which make dyeing their sole business. Many other industries, such as hat factories, braid mills, ribbon mills and bleacheries, have dye departments.

#### **Need Ventilation**

All these establishments need mechanical ventilation or, more properly defined, mechanical vapor removal systems.

Unless there is some mechanical means for getting rid of the steam that arises from vats and machines

# Industrial Vapor Removal

*A profitable field so far sidestepped by both furnace and ventilation contractor ~ ~ ~ ~ ~*



this steam condenses on walls and on the under side of roofs, due to the chilling of the warm vapor below its dewpoint. Wall sweating is by no means as annoying as ceiling sweating. The former can be endured, but the latter drops on finished work, on workmen and machinery, causing rusting, discomfort and injury to goods in process.

The ideal way to handle the vapor would be to exhaust it as soon as it is generated. This often is done by erecting hoods over sources of trouble, connecting the branches into mains and then exhausting the whole load by means of large centrifugal fans at a central point. If air velocities as high as 300 linear feet per minute across the mouth of each hood are used this can be done fairly effectively.

Many superintendents and owners object to this, however, as they say these hoods interfere with the proper operation of the processes. Large, cumbersome overhead ducts run into considerable first cost and maintenance, for in dyeing, for instance, Paris green and other injurious chemicals in dyes often attack the metal and make renewals frequent.

To ventilate such buildings many owners install large propeller fans in cupolas and skylights. These do an imperfect job in most cases because the fans are too far from the source of steam emission to be effective, and constant dampness passing over motors causes frequent electrical trouble. Belted rigs, more proper in this case than direct-connected fans, cause belt trouble and are only partially effective unless the rooms are placed under pressure by introducing supply air to assist in the upward progress of the vapor to the fans.

### Warm Air Ventilates

The best method of handling the situation, therefore, is to feed small quantities of warm air along walls and ceilings much as shown in Fig. 1 and the several illustrations accompanying this article. If we assume that the air in the room is at 70 degrees, we know that each cubic foot can hold in suspension 7.98 grains of moisture maximum (at saturation).

Every heating contractor knows that the warmer the air the greater is its ability to hold moisture. Thus, the air to be supplied to vapor filled rooms, instead of being 70 degrees, is 100 degrees, for at this temperature every cubic foot can hold in suspension a maximum of 19.77 grains of moisture per cubic foot; considerably more than double that held by 70-degree air.

The heavily charged air then passes upward by natural forces and is exhausted either through roof ventilators or through mechanical exhaust fans placed in skylights or in pent houses, the fans connecting to short ducts that protrude through the ceiling into the rooms being ventilated.

Successful clearance of this type of room requires rapid theoretical air change. Some engineers specify

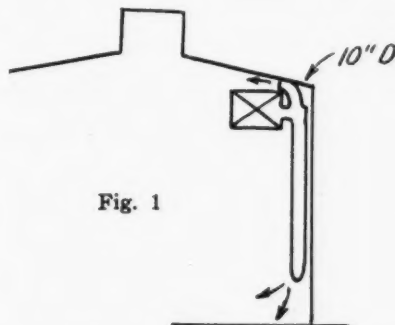


Fig. 1

Trunk lines may run along the sides with drop branches to introduce the warm air close to the floor

a change every  $1\frac{1}{2}$  minutes, while others estimate a change for every 5 minutes. In the installation outlined in Fig. 2, a 4-minute air change has been recommended, for the absorption (supply pick-up) method requires less frequent change than plain suction systems.

In designing such a system it is customary to discharge one warm air stream downwards towards the floor and another, smaller, supply along the ceiling. There are five

branch connections shown in Fig. 2 for each of the two long sides, or ten in all. Assuming 800 linear feet per minute as the rate of discharge through inlets, this being about twice that ordinarily discharged through wall grilles in ventilating work, the supply branch to the floor is  $12\frac{1}{2}$  inches in diameter, to handle 700 cubic feet per minute. The branch that delivers to the ceiling is 10 inches diameter, to release 400 cubic feet per minute.

Each of the ten major branches therefore delivers 1,100 cubic feet per minute and is 16 inches in diameter. The total volume of air handled by the fan is 11,000 cubic feet per minute, which requires a fan of substantial size.

### Proportioning Ducts

In proportioning ducts in waste removal systems, many engineers increase the size of the main duct towards the fan inlet by 20 per cent per branch. As each branch is cut in, 20 per cent is added to the total area of the main. The same procedure is followed progressively to the fan.

In the system shown in Fig. 2, it is desired to keep the main air speed at 1,200 feet per minute. While this increases the power required somewhat, as contrasted with the more liberal sizing, were this main figured at its maximum its velocity would be lowered to about 500 feet per minute at the fan inlet, and this is undesirable from appearance and increases the first cost of the installation unnecessarily.

Better results will always be secured from round rather than rectangular ducts because their friction loss is less. Modern desires, however, run to rectangular ducts on account of their saving in head room and better appearance. Were the two mains to be round pipe, their sections would increase from 16 to 18, to 23, to 27, to 29 inches, found by dividing the volume in cubic feet per minute by the velocity in feet per minute. The quotient is the area.

The desire for head room sug-

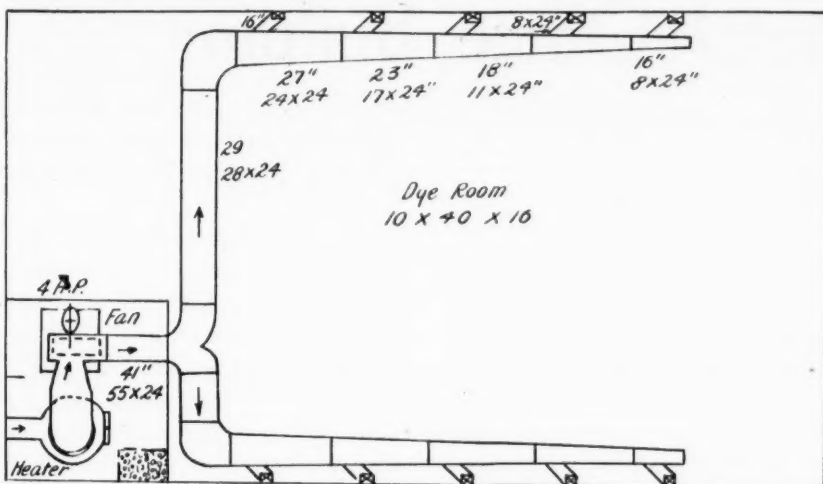


Fig. 2. This plan shows a heat introducing system whose purpose is to supply warm air which in turn permits more vapor to be held in suspension. Rising warm air is exhausted through the roof

gests making the duct uniformly 24 inches deep, its width becoming progressively larger as the volume becomes greater as the fan is approached. Starting as 8 by 24 inches, the next section is 11 inches wide, then 17 inches, then 24, and finally 28 inches wide. The fan outlet would be 41 inches diameter or 55 inches wide by 24 inches deep. The round shape is better because, being within the fan room, neither head room nor appearance are important.

Recirculation of air in the presence of vapor is undesirable and can be effected only by means of a dehumidifying system using refrigerated water to chill the air below its dewpoint, thus causing deposit of its moisture. Hence, we figure a heater to raise the air supply from zero, or lowest normal temperature for the locality, to 110 degrees. Some 10 degrees will be lost within the piping system, so that 100-degree air is delivered at the distributing outlets.

If desired, a steam boiler can be installed, whereupon the supply would pass through steam sections for heating. But a more logical and, perhaps, better heating plant is the warm air furnace as shown in the drawing. The bonnet is connected to the inlet of the fan without elbows, easily effected by bolting the fan and its motor to a plat-

form of the proper height. If it is necessary to install two warm air heaters in the same casing, or two separate heaters with their bonnets connected into a single fan supply connection, this, too, can be easily done.

#### Fan Sizes

In estimating the size for overhead exhaust fans, their capacity should be slightly less than the 11,000 cubic feet per minute delivered, so as to keep the room under a slight pressure. This affords better circulation of the supply, keeps the air in the moisture generation zone long enough to pick up as large a load of moisture as possible. If the air is raced through the room it will not pick up as much moisture as it will if its progress is slower.

Instead of attempting to exhaust with a single propeller fan, it is well to divide the work into three fans of about equal capacity, each fan handling about 3,000 cubic feet per minute and situated some 20 feet apart.

In making the ducts for vapor absorption systems where there are chemicals present it is suggested that 22-gauge galvanized iron or steel be used, because the dampness, usually of chemical composition, attacks metal, and light metal would likely have to be renewed frequently. In some mills mains are

made of wood and other chemical-resistant materials, yet good service will be obtained if ducts are painted inside and out with a high grade metallic paint.

Systems of the variety here discussed can be used successfully in any steam laden room. Some states make positive removal of steam in workrooms compulsory, and as years pass it is believed this will be the general custom because of the danger to the health of operators who have to work in such places.

As a variation from the system laid out as a practical example there are many commercial plants that need vapor removal systems, but the points of steam generation are near the center of the rooms instead of near the outer walls. In this case the warm air is discharged near the source instead of near the walls.

This sort of vat arrangement lends itself more readily to overhead exhaust rather than warm air supply and absorption. It can be assumed that when rooms are under slight pressure, as with the absorption system described, and air is supplied at 100 degrees temperature, no further provision need be made for heating. The system thus becomes a combined heating and ventilating and air conditioning system.

## An All-Metal Office Building

the use of the same die for the extruded shapes in the cornice and around the edges of the pilasters.

#### Erection Simplified

The construction of the building was greatly simplified and the time required for erection materially reduced because of the ease and simplicity with which the metal forms were assembled. Only four and one-half months were required for the completion of the building, thus enabling the owners to capitalize on their investment in a much shorter

(Continued from page 16)

period of time than would have been possible had the ordinary construction methods been employed.

The cost of this building definitely shows the economies resulting from the use of metal and sums up the many advantages to be derived from applications of metal in building construction. The building has a cubical content of 222,244 cubic feet, and without such accessories as partitions, floor coverings,

window shades and the like, cost 19.1 cents per cubic foot; with accessories it cost 22 cents per cubic foot.

The plans for the building were prepared in the Department of Public Works, of which Col. R. Keith Compton is director, by the Bureau of Surveys and Design. W. A. Childrey, assistant engineer of the Bureau, designed the details of construction and co-ordinated the work of the several sub-contractors, the Department of Public Works acting as its own general contractor.

# EDITOR'S *Roundtable*

## Should We Abolish Factor 55?

WE presented for discussion in the April 28 issue, a question sent us by B. L. Schwartz of Pittsburgh. The question was, "Shall we abolish factor 55?" Here are two answers:

### G. A. Voorhees, Indianapolis

The assumption in practical heating calculations, that we are dealing with 70-degree air, is merely a convenience. Actually, of course, the heat content of air depends upon its temperature and its weight—not its temperature and its volume. Therefore it is more accurate to deal with pounds of air instead of cubic feet of air, but it has become customary to figure our air volumes in cubic feet and, for further simplification, to assume that the air temperature is 70 degrees.

Suppose we have a room requiring 9,000 B.t.u. per hour and our plant is to deliver warm air at 135 degrees F., and to withdraw the return air at 65 degrees. The temperature drop in the room is  $135 - 65 = 70$  degrees, and since 1 pound of air gives up 0.24 B.t.u. for each degree of temperature drop, the total heat made available by each pound of entering air will be  $70 \times 0.24 = 16.8$  B.t.u.

Then, since 1 pound of air in this case yields 16.8 B.t.u., the weight of air needed to supply the room requirement of 9,000 B.t.u. per hour will be  $9,000 \div 16.8 = 535.7$  pounds per hour or 8.93 pounds per minute.

It doesn't matter whether we measure the quantity of air at the blower where the temperature is 65 degrees, at the furnace bonnet at 150 degrees, at the register at 135 degrees, or at the breathing level in the room at 70 degrees, the weight of air being handled by the system is 8.93 pounds per minute.

But the volume will vary with the temperature. To determine the number of cubic feet of space occupied by 1 pound of air at any temperature, add

460 to the temperature and multiply the sum thus obtained by 0.0252.

Thus our 8.93 pounds of air per minute is converted into equivalent volumes at the various temperatures as follows:

At 65 degrees,  $0.0252 \times (65 + 460) \times 8.93 = 118$  c.f.m.

At 70 degrees,  $0.0252 \times (70 + 460) \times 8.93 = 119$  c.f.m.

At 135 degrees,  $0.0252 \times (135 + 460) \times 8.93 = 134$  c.f.m.

At 150 degrees,  $0.0252 \times (150 + 460) \times 8.93 = 137$  c.f.m.

But it's much more convenient to assume that we are dealing always with 70-degree air and it has therefore become customary in practical engineering calculations to do so.

Suppose the air to this room is being conveyed by a duct at an assumed velocity of 500 f.p.m. and an assumed temperature of 70 degrees, whereas the actual temperature of the air is 135 degrees. Our calculation would give us a duct area of  $119 \div 500 = 0.24$  square foot. But the actual volume of air being carried is 134 c.f.m. instead of 119 c.f.m. (because the actual temperature is 135 degrees instead of 70 degrees) and the actual velocity is therefore  $134 \div 0.24 = 560$  f.p.m. This increase in the actual air velocity above the assumed velocity, increases the frictional resistance, but practical experience shows that for all ordinary jobs we may neglect this increase without getting into difficulties. Taking it into consideration would complicate our calculations to an extent not justified by results.

### F. H. Geer, Chicago

Another letter equally interesting comes from T. H. Geer of the Sunbeam Heating and Ventilating Co., Chicago. Mr. Geer says:

I cannot agree with Mr. Schwartz when he says that "we are interested in 135-degree air at 45 per cent relative humidity."

What we are interested in is 70-degree room temperature at 45 per cent relative humidity, or thereabout.

At 135 degrees F. 1 cubic foot of saturated air contains 0.007249 pound of vapor. At 45 per cent relative humidity it would contain 0.003262 pound, or more than six times the weight of vapor in 1 cubic foot of 70-degree air at 45 per cent relative humidity.

This excess moisture would be deposited in the room as the air cooled from 135 to 70 degrees.

As to taking humidity into account in duct design, if I am not mistaken, Prof. Willard has made the statement that it has so little effect that it can be ignored.

Considering temperature only, dry air at 135 degrees F. will absorb 0.01618 B.t.u. per cubic foot, and 1 B.t.u. will raise 61.8 cubic feet one degree.

Now, taking into consideration that Mr. Schwartz has taken his temperature rise from the return air temperature instead of the room temperature, as a base, we will calculate the c.f.m. required for a room with a heat loss of 10,000 B.t.u.

$$\text{B.t.u.} \times 55$$

$$1. \text{ C.f.m.} = \frac{\text{(reg. temp. — room temp.)} \times 60, \text{ or B.t.u.} \times 0.0141}{\text{B.t.u.} \times 61.8}$$

$$2. \text{ C.f.m.} = \frac{\text{(reg. temp. — return temp.)} \times 60, \text{ or B.t.u.} \times 0.0147}{\text{B.t.u.} \times 61.8}$$

$$1. 10,000 \text{ B.t.u.} \times 0.0141 = 141 \text{ c.f.m.}$$

$$2. 10,000 \text{ B.t.u.} \times 0.0147 = 147 \text{ c.f.m.}$$

For a branch duct velocity of 400 feet per minute, a duct size of—

$$141 \times 144$$

$$1. \frac{\quad}{400}, \text{ or approximately } 51$$

square inches will be indicated.

$$147 \times 144$$

$$2. \frac{\quad}{400}, \text{ or approximately } 53 \text{ square inches.}$$

Handling 135-degree air in a duct designed for standard 70-degree air, we have only increased the velocity from 400 to 415 feet per minute—a little less than 4 per cent.

# What Is Air? [Part II]

By MALCOLM TOMLINSON

Consulting Engineer

THE composition of the air and the characteristics of the gases and impurities which go to make up the mixture which we call air have been discussed. It is now possible to consider air as an air-water vapor mixture. It is this sort of air which, with all its impurities, we must deal under practical living and working conditions.

Naturally, when air is a complete mixture, its characteristics are a combination of the characteristics

The later factor increases with the density and the temperature of air, but decreases with an increasing volume. These relations can best be expressed by the following equation:

$$PV = WRT$$

in which—

P is the absolute pressure in pounds per square foot,

V is the volume in cubic feet,

W is the weight or density in pounds,

T is the temperature in degrees F. on the absolute scale,

R is a constant value which balances the equation.

## Measuring Scales

Temperatures and pressures are expressed in two different ways.

One is by means of what is known as the absolute scale, and the other is the ordinary method of expression.

As ordinarily expressed, zero degrees F. is 32 degrees below the freezing temperature of water, and zero pounds pressure per square inch is the normal pressure of the atmosphere. For pressure this customary method of measurement is known as *gauge* pressure, as all pressure gauges are based on a zero reading for atmospheric pressure. With absolute units, the freezing point of water is 491.6 degrees above absolute zero, so that zero in ordinary temperature units is 459.6 degrees above absolute zero. Also atmospheric pressure at sea level is 14.7 pounds per square inch above the absolute zero of pressure.

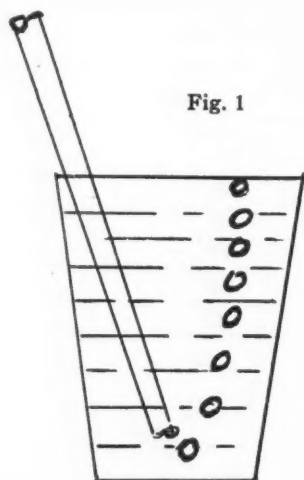


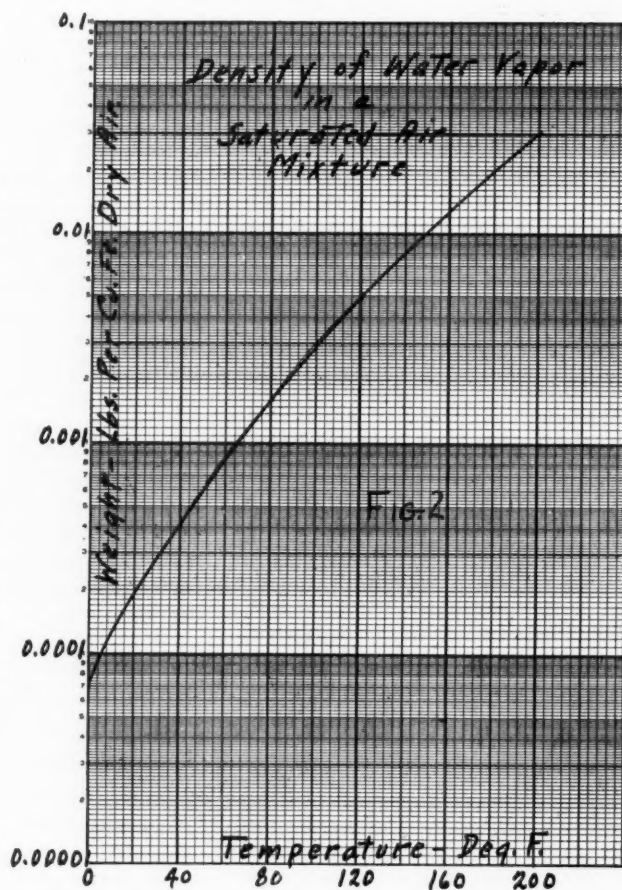
Fig. 1

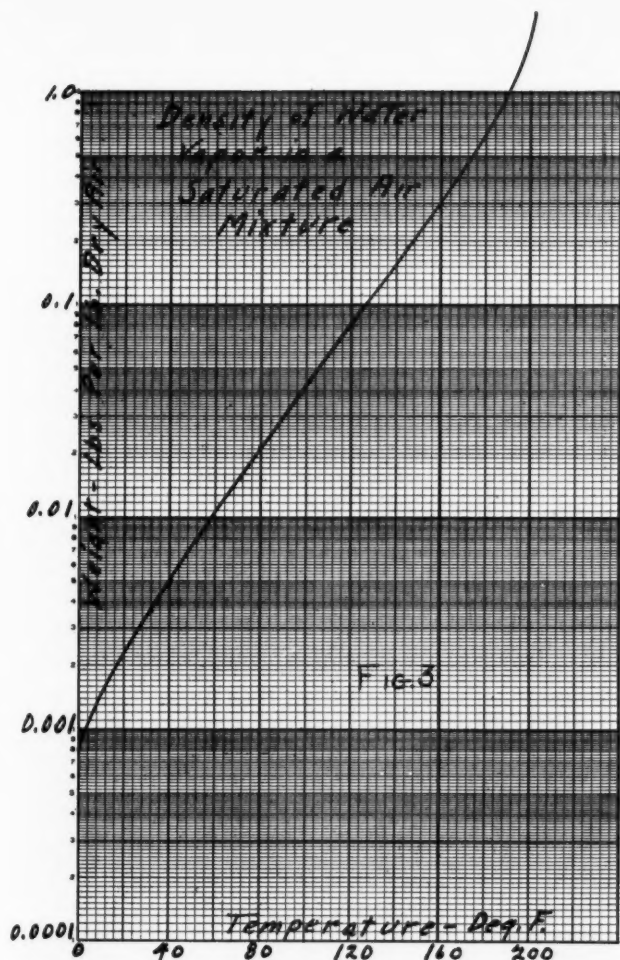
of its gases. For instance, water absorbs oxygen and nitrogen in small quantities, but cannot absorb carbon dioxide. Neither can it absorb air. Take a glass of water and try blowing air into it through a tube (Fig. 1). The air enters the water in the form of bubbles which rise quickly to the surface, where the air escapes. Again, while a rising temperature *decreases* the density of *dry* air and *increases* the density of *water vapor*, the same action *increases* the density of *air*, because air is a mixture of both dry air and water vapor. Furthermore, *increasing* the temperature *increases* the volume of mixed air much faster than it does for dry air.

The effect of temperature on air is equaled by the effect of pressure.

Air is not absorbed by water. It escapes as quickly as possible into the surrounding atmosphere

The curve of the density of water vapor in a saturated air mixture represents the maximum weight of water vapor which can mix with air which is dry under the temperature range shown





Air conditioning problems are usually figured in terms of pounds of dry air rather than cubic feet. Note how weight increases as temperatures increase. This curve is for saturated air

Absolute units are used mainly in technical calculations.

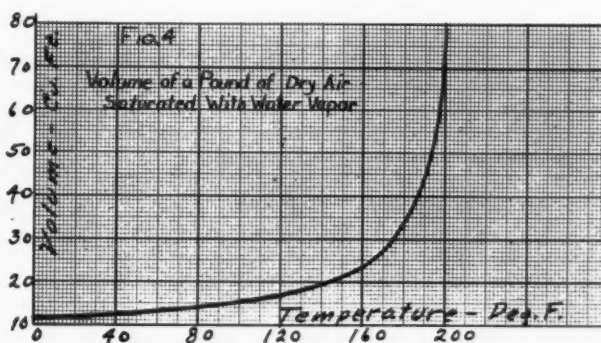
### Pressure Changes

Liquids change into gases, or gases into liquids, at fixed or critical temperatures which depend on the nature of the substance or element concerned. Water, for example, vaporizes or boils at 212 degrees F. at sea level or under an atmospheric pressure of 14.7 pounds per square inch. Now, every gas, and the liquid which corresponds to it, as (for instance) water vapor and water, exert definite pressures dependent on the temperature. Therefore, such pressures change with changes in temperature. Such pressures are known as *partial pressures*, since they are of special value in calculations for gas mixtures and liquid solutions.

In air calculations it is customary to refer to the partial pressure of water vapor as *vapor pressure*. In mixtures and solutions these partial

pressures may vary greatly in value. For example, the partial pressure of dry air is very high when the vapor pressure is low. This is due

Compare with curve in first article which shows the volume of dry air which has not been mixed with water vapor. Note how rapidly the volume of saturated air increases above 100 deg. F.



to the fact that the sum of the two pressures is equal to the total pressure of the atmosphere. For instance, the vapor pressure for sea level at 70 degrees is 0.36 pound per square inch with saturated air. If this figure is subtracted from the atmospheric pressure of 14.7 pounds per square inch, the difference, or 14.34 pounds, is the pressure of the

dry air in the saturated air mixture. Under identical conditions of location and temperature, the partial pressure of water is exactly the same as for water vapor.

There is a maximum partial pressure for water vapor for each temperature. This limit absolutely controls the amount of water vapor present, and, therefore, determines not only when an air mixture is saturated, but also fixes the maximum weight of water vapor which can be contained in any air mixture.

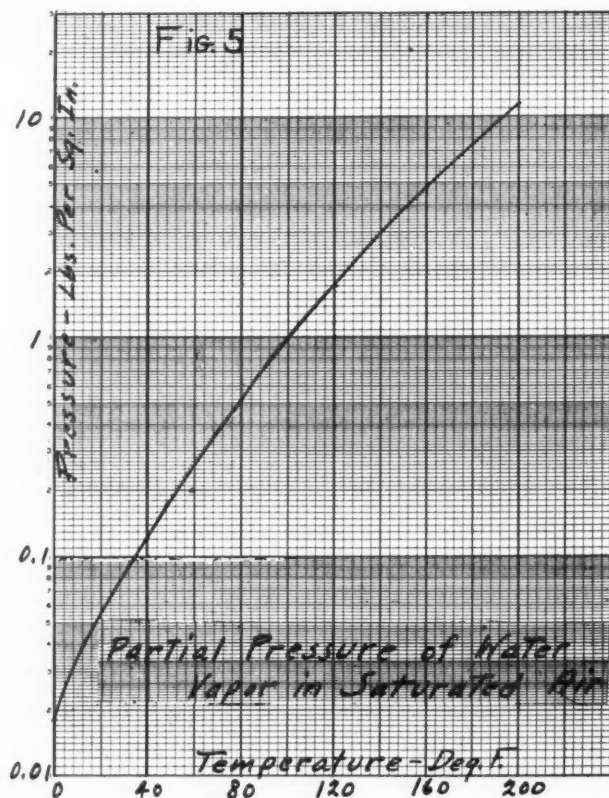
### Pressure Governs Vapor

The factor which controls the relation between dry air and water vapor is, therefore, *pressure*, and not some mysterious power of absorption.

In other words, *air has no power to hold or absorb moisture*, but dry air and water vapor act in exactly the same manner as all gases when in contact. When the diffusion between the two gases has reached the saturation point, which we have seen is controlled by pressure, further mixing ceases until some change in conditions of temperature or pressure raise the saturation point.

Two important results of the ac-

tion of pressure on air are the effect of altitude, which includes height above sea level as well as depth below sea level, on air calculations and the change in boiling point of water caused by changes in pressure. For example, the normal atmospheric pressure for 15,380 feet above sea level is 8.35 pounds per square inch, but for 1,000 feet be-



low sea level is 15.25. This fact has no influence on the vapor pressure, but it does affect the partial pressure of the dry air in the air mixture. As far as boiling point is concerned, an increase in altitude or a decrease in the absolute pressure has a lowering effect. Thus, for an absolute pressure of 8.35 pounds per square inch, the boiling point is depressed to 184.8 degrees. Therefore, altitude influences boiling point and, for the same reason, evaporation.

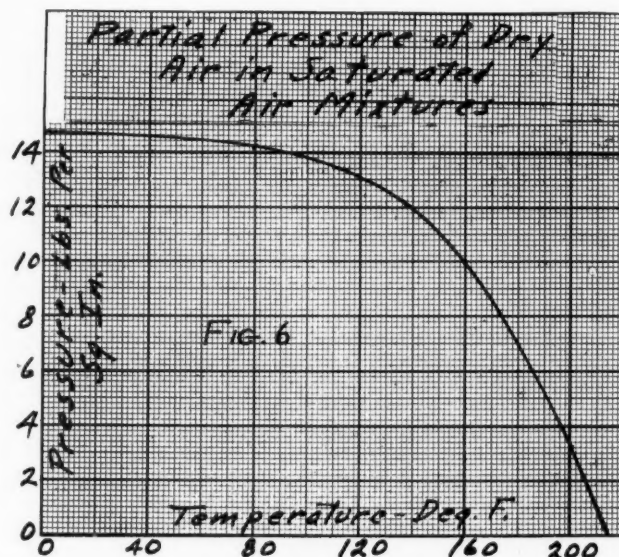
#### Effect of Pressure

The effect of pressure on boiling leads to a consideration of vacuum.

The partial pressure of dry air is high when the partial pressure of the water vapor in the same mixture is low. It is low when the vapor pressure is high. This is because the sum of these two pressures is the total pressure of the atmosphere

We have seen that the zero for absolute pressure is 14.7 pounds per square inch below the pressure of the atmosphere and that atmospheric pressure is zero in terms of

The partial pressure of water vapor is the same thing as the vapor pressure of water. For saturated air the vapor pressure increases as the temperature rises. It is this vapor pressure which limits the weight of water vapor which can mix with dry air



ordinary or gauge pressures. In cases where air is exhausted from a closed vessel the condition created is known as a vacuum.

There are four methods of expressing the various conditions of vacuum which have been tabulated so that equivalent pressures can be found on the same line. By lowering the absolute pressure, or producing a vacuum, the boiling point is decreased. Furthermore, as the vacuum is increased, or the absolute pressure decreased, the air remaining in the vessel is diminished. But the production of a perfect vacuum, or the removal of all air, is not practical. Naturally, with a vacuum, less heat is required for evaporation, but the cost of pump-

ing out the air and of condensing its vapor at the necessary rate overcomes the advantage mentioned.

#### Pressure Balance

It has been stated that, altitude and temperature conditions being equal, the vapor pressure for water and for water vapor are equal. If a jar of practically dry air be placed over a vessel filled with water in such a manner that the point between the jar and vessel is sealed, and if the temperature of the water be held at a constant point of, say, 70 degrees, evaporation will proceed and the water vapor thus produced will diffuse into the air in the jar. This process will continue until

TABLE 1

Relation Between Methods of Measuring Low Pressures

Method of Measurement	Absolute		Vacuum	
	Lbs./Sq. In.	Ins. Mercury	Lbs./Sq. In.	Ins. Mercury
Atmospheric Pressure .....	14.7	29.92	0	0
	14.0	28.50	0.7	1.42
	12.0	24.43	2.7	5.49
	10.0	20.36	4.7	9.56
	8.0	16.29	6.7	13.63
	6.0	12.22	8.7	17.70
	4.0	8.14	10.7	21.78
	2.0	4.07	12.7	25.85
	1.0	2.04	13.7	27.88
Low Vacuum .....	0.5	1.00	14.2	28.92

Readings across this table give equivalent pressures in terms of the absolute and of vacuum. For example, a half pound pressure per square inch absolute is equal to 28.92 inches of vacuum

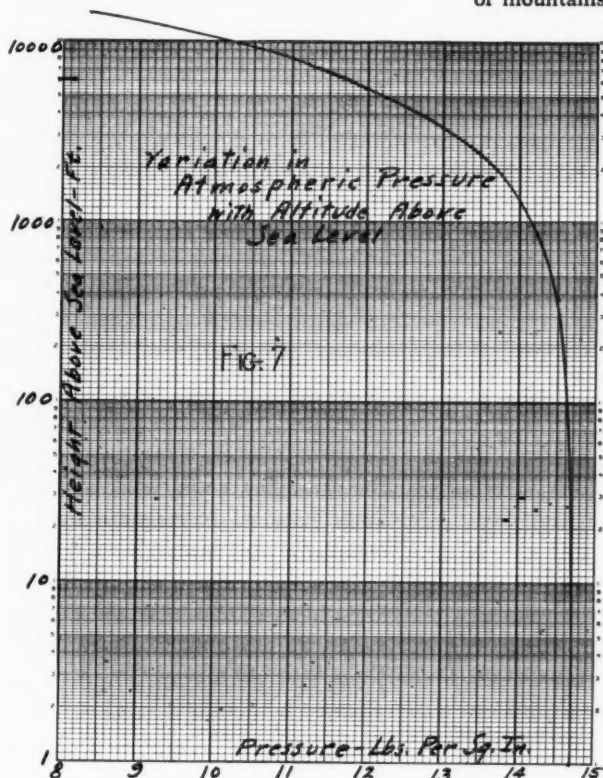
the vapor pressure of the water vapor is equal to that of the water. Equilibrium in partial pressure will be reached as well as equilibrium of temperature.

Equilibrium, or the constant effort of nature to balance temperature and pressure, is always under way. Of course many natural conditions arise to upset any condition of balance which has become established. Nevertheless, the only sustained effort to maintain a constant equilibrium is man-made. Even the most crude type of heating system was an effort to destroy equilibrium and set up a temperature difference between the air without and within a building. Mechanical fan systems were an effort towards a more uniform temperature difference. In

the absolute humidity when this water vapor is saturated. As already shown, the absolute humidity is fixed by the vapor pressure for each degree of temperature. The relative humidity, on the other hand, is the ratio between the vapor pressure which actually exists and the

or given up by certain materials in contact with air. It is expressed as a percentage, so that 100 per cent relative humidity represents air in its most humid or moist condition, which is saturation. The materials which absorb moisture from water vapor are called hygroscopic. Some

As the height above sea level increases, air becomes less dense and its pressure decreases. This change does not affect the vapor pressure but it does reduce the partial pressure of the dry air in air mixtures. This change in pressure with height is used to roughly determine heights of mountains



such systems pressure began to play a part. Air conditioning is a mechanical method of breaking down equilibrium in air temperatures, pressures and humidities, and also of maintaining the differences created in these three factors.

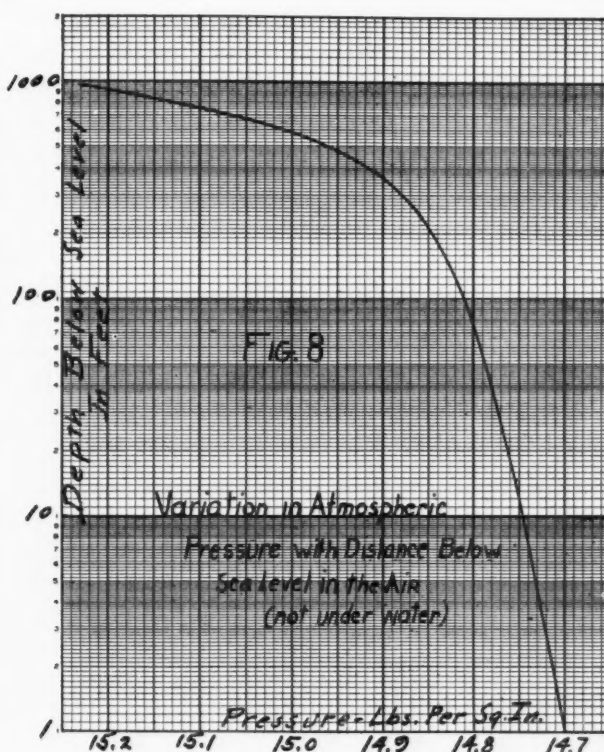
### Humidity

This brings us to the subject of humidity. The weight of water vapor in the air mixture is known as

vapor pressure for saturation at the same temperature.

The absolute humidity, then, is the density of the water vapor at saturation. Except that it furnishes information of this nature it plays no particular part in air conditioning problems. The relative humidity, on the other hand, is a vital factor. Its importance was first discovered through the fact that it controls the amount of water absorbed

Under ground in mines and also in depressions of the earth's surface below the sea level, normal atmospheric pressure is greater than 14.7 pounds per square inch



of the most common are paper, textiles, leather and sand. They include materials from vegetables, animals and minerals. The maximum amount of moisture which can be absorbed varies for each material and for the per cent of relative humidity. It is known as regain.

We now know that relative humidity, together with temperature and the rate of air motion, plays a most important part in human comfort. Furthermore, since pressure relations determine the relative humidity, and since altitude changes the total pressure of the air, it is only fair that pressure should be included with the three factors mentioned when comfort is considered.

Pressure, then, has a far-reaching influence not only in the relations between dry air and water vapor but also in evaporation, equilibrium, moisture regain, and human comfort.

# Pattern for a Furnace Boot

*For Peter Liver, Winona, Minn.*

**By L. F. HYATT**

*Contributing Editor*

**T**HIS furnace boot pattern problem was submitted by a Minnesota reader of the ARTISAN. It differs somewhat from the usual kind, since it is vertical on one side, as shown by the drawing.

Begin by drawing the plan, elevation and profile views the necessary size, as shown. Divide the circles representing the circular opening of the collar into the twelve spaces, and number as shown. In practice, the complete view marked profile is not necessary, only the circle being needed. Now from each of these points 1-2-3-4-5-6-7 draw horizontal lines intersecting the line of intersection between the collar and body part of the boot and number as shown on line 4-4 on the plan view. Draw lines connecting each of the points 1-2-3 respectively, with point C on the rectangular opening. Also connect points 1-2'-3'-4 with corner D. Now connect points 5-6-7 with corner B. These lines are of course on the lower side of the boot. Next connect the points 5'-6'-7 with the corner A. On the elevation view these lines are shown looking at it from the side of the boot.

Now draw the line m-n far enough from the elevation view to allow the true length lines to be drawn. Extend the lines from the points on the circle in the profile view, to the line m-n, and number the points as shown. These numbers will help to avoid confusion when obtaining the true length of the lines. Draw a line from x intersecting the line m-n and locating the point S, from which all the true length lines are drawn.

The true length lines may now be obtained in the following manner: With the instruments set the distance 1 to c found on the plan view; step off this distance on the horizontal line from point 1 on the

line m-n locating point 1c, and after locating the point draw the true length line from this point to point S on m-n. Next take the distance 2 to c from the plan view and step off from point 2 on line m-n. This distance locates point 2c on the group of true length lines. Next take the distance 3 to c and from point 3 on line m-n located 3c as was done before. Now take the distance 4 to c and from point 4 on the line m-n locate as before point 4c. Next obtain the true length of the four lines extending from 4-3'-2' and 1 to D, exactly as before. It is important that the distances be stepped off from the correct points on m-n.

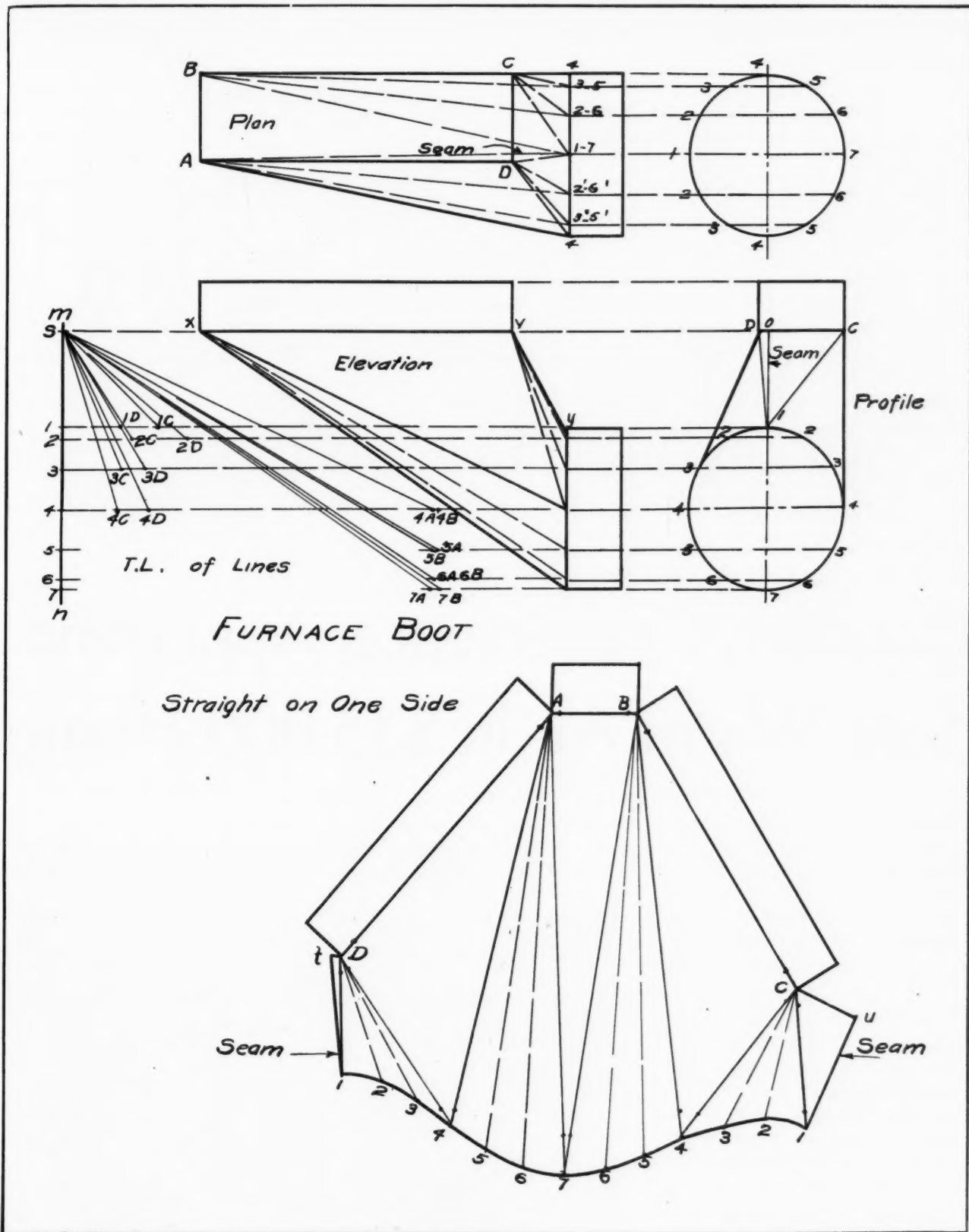
Now to obtain the true lengths of the long group of lines take the distance 7 to B found on the plan and from point 7 on line m-n step off as was done before, thus locating point 7B, and connect this point with S as was done with each point before. Continue with the other group of lines running to point A. When this group of true length

lines is completed the development of the pattern may be commenced.

Draw the line AB of the pattern equal in length to the length AB found on the plan, and letter the points A and B as shown. With the distance 7A to S, and A on the pattern as a center, strike an arc of indefinite length. Now with the distance 7B to S and B as a center strike an arc intersecting the one just drawn locating point 7 of the pattern. Next, with the distance 6A to S, and A on the pattern as a center, strike an arc of indefinite length. Now set the instruments equal to the distance 7 to 6 found on the profile view, and with 7 as a center strike an arc intersecting the arc just drawn locating point 6 on the pattern. With the distance 6B to S as a radius and B as a center, strike an arc as before, and with the instruments set the same distance as previously (all 12 spaces are equal) strike an arc intersecting the one just drawn locating point 6 at the right of point 7. Continue in this manner until the triangles constructed with the long group of true length lines are completed.

Now with the distance 4D to S and 4 on the pattern as a center, strike an arc of indefinite length. Next take the distance A to D as a radius, and with A as a center strike an arc intersecting the arc just drawn locating point D on the pattern. Now with the length 4C to S of the true length lines and 4 as a center strike an arc of indefinite length. Then with B to C as a radius and B as a center strike an arc intersecting the arc just drawn locating point C on the pattern. Next, with the distance 3C to S of the true length lines and C as the center, strike an arc of indefinite length, and with the distance 4 to 3 on the profile view, and 4 on the pattern as a center, strike an arc

**As a part of *American Artisan's* enlarged service to readers, we invite subscribers to make use of the services of our two contributing pattern editors, L. F. Hyatt and W. R. Haines. This service is free. We ask, however, that you send your problem on your letter head and sketch the pattern as completely as possible to save time. We also desire permission to publish any patterns developed**



intersecting the arc just drawn locating point 3. Continue with the other lines of the short group up to and including 1 to D and 1 to C.

Now with the distance v to y found on the elevation view, and points 1 on each end of the pattern as centers, strike arcs of indefinite

length. With the distance D to O on the profile view and D on the pattern as a center strike an arc intersecting the arc already drawn, locating point t. Next, with the distance o to C on the profile and C as a center, strike an arc intersecting the arc previously drawn, locat-

ing point u, thus completing the pattern.

The laps and seams have not been added and the rectangular piece corresponding to the small rectangular end AB on the pattern must be made separate and soldered in place.



## Comfort, Convenience, Appearance Sold Warm Air in \$35,000 Home

**J**UST how far the warm air heating industry has progressed in its drive to leadership among types of domestic heating systems was forcefully illustrated recently with the completion of a conditioning system in a \$35,000 home in a Cleveland suburb.

The reason this installation illustrates our progress is because the house owner, no longer ago than two years, probably would not have considered warm air for his residence. This progress is further indicated because in the system are most of the features which we say are exclusive with warm air and entirely in keeping with the public's present demand for comfort, cleanliness, humidity, and convenience.

The system is interesting, also, because all these present day demands are supplied without resorting to anything theoretical, radical or untried.

The house is owned by Judge Lee

E. Skeel and was designed by George H. Burrows, architect, of Cleveland. The system was engi-

neered by the Fox Furnace Company and was installed by the sheet metal contracting firm of Riester



Registers are in sidewalls above the baseboard. The faces were installed in the prime coat and painted to match the color scheme of the room

and Thesmacher of Cleveland.

Structurally the house is a combination of stone, brick and wood siding blended architecturally into a beautiful residence. There are ten master rooms in addition to maid's quarters on the third floor and a large recreation room in the basement. Heat is also supplied to the garage which is attached.

The finished heating system illustrated nicely just how much comfort and convenience warm air heating can give the home owner. Operation is automatic all the way through, beginning with the gas burning furnace, and including full controls over all operations of the equipment. So far as the owner is concerned, all the attention he will be called upon to supply will consist of having the furnace turned on in the fall and off in the spring.

### Comfort and Convenience

Comfort is assured by the design of the system and the incorporation of such desirable features as mechanical circulation of warm air, low air temperatures, and controlled humidification by instruments located in the first floor hall.



The basement recreation room has both warm air supply and a direct return to insure constant circulation

The furnace is a unit type heater with blower, filters, humidification apparatus and the furnace are all engineered into one compact casing. Because the furnace operates with forced air, it could be placed in a corner out of the way.

### Humidity

The owner of the house was particularly impressed with the need

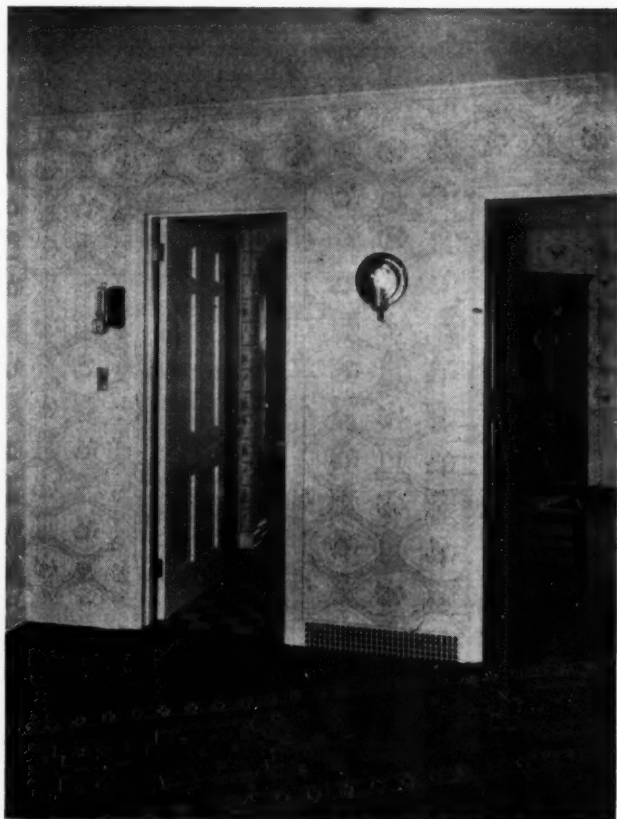
for adequate humidity and readily understood how the proposed system would supply this desire. In operation two spray heads located in the bonnet shoot against two hot plates located at either side. Pressure to the heads is regulated by a hand valve so that differences in line pressure can be controlled readily. The humidity control unit is placed in the first floor hall alongside the thermostat. When the relative humidity in the house falls below 45 per cent the control turns on the water to the sprays, after the blower goes on. When the humidity is brought up to 45 per cent the spray heads are shut off until another cycle is needed.

Operation of the furnace is controlled by a thermostat which turns on the gas burners. The blower is actuated by a bonnet stat which starts the fan when the temperature within the casing reaches a predetermined temperature. This temperature is set to give 135 degrees temperature at the registers.

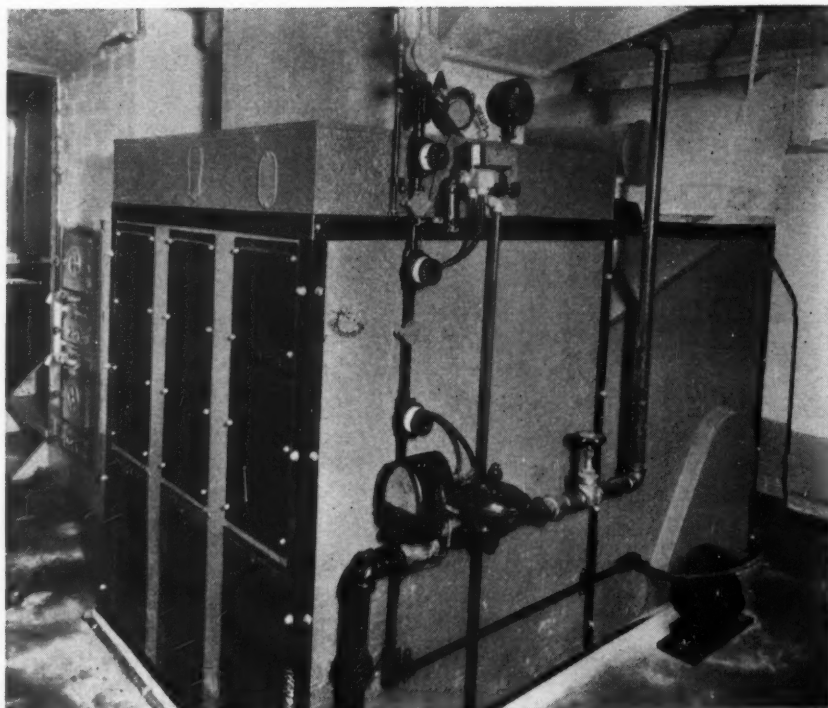
Comfort is further assured by holding the register temperatures to 135 degrees which means that there are longer cycles of circulation, which was considered desirable.

### Cleanliness

A bank of viscous treated filters ahead of the blower clean the air as it is drawn from the house. With



The valveless return air grille in the hall shows how all grilles were located in the baseboard. The faces were installed in the prime coat and painted to match the woodwork. The thermostat and the humidity control are located in the hall. The text explains how humidity is controlled



Left is a view of the furnace with the blower and filter cabinet in the casing. The furnace is fully equipped with controls. Supply mains are taken off the top as three separate runs

a rapid turnover of air the system passes all the air within the house through the filters several times an hour in cold weather and at least several times a day even in mild spring weather.

### Design

There are a number of interesting points in the design of the system as, for instance, the maintenance of 70-degree temperatures in all master rooms excepting the baths where 85 degrees is maintained. The heat requirements of the house are 154,350 B.t.u. while the heating plant

has a capacity of 210,000 B.t.u.

The system is designed for low register temperatures, low register velocities and reasonably low ve-

locities through mains and branches. The velocities for the system are as follows:

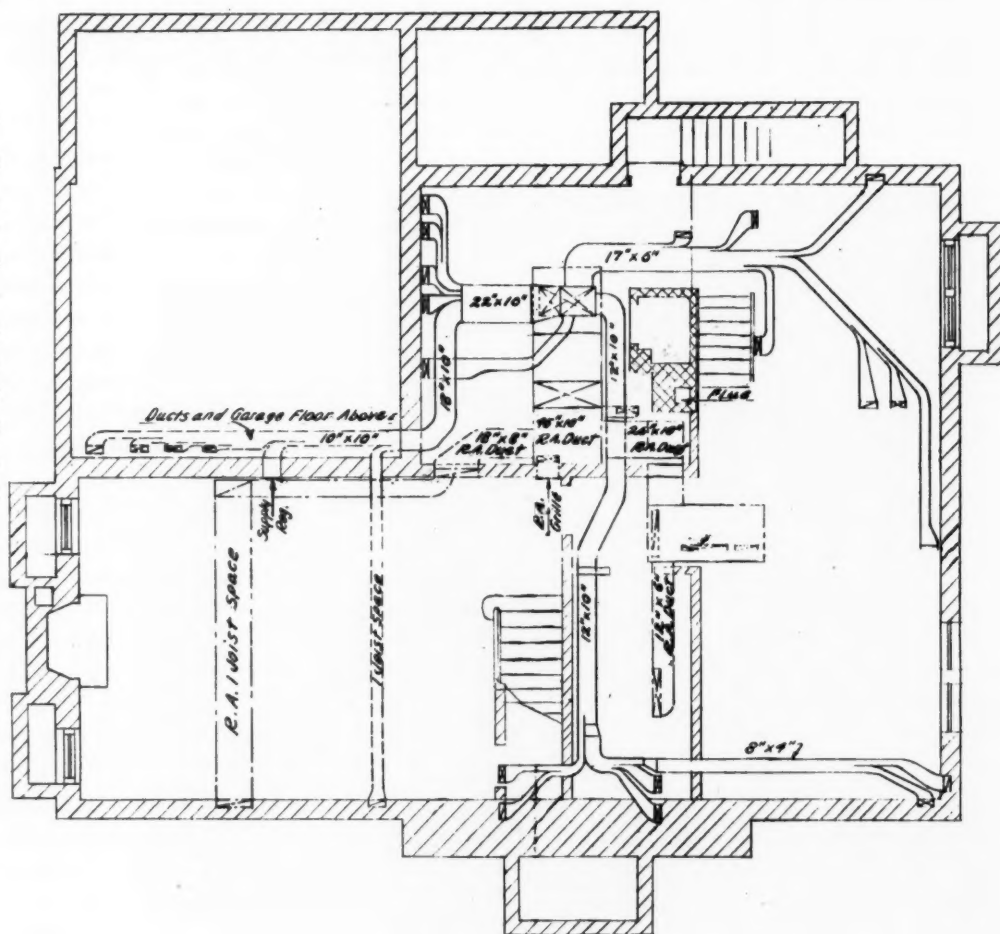
Mains .....	600 f.p.m.
Branches .....	500 f.p.m.
Risers .....	400 f.p.m.
Registers .....	250 f.p.m.

At these register temperatures and velocities, the required c.f.m. was 1958 which is supplied at an approximate blower r.p.m. of 350.

The system is designed for  $4\frac{1}{2}$  air changes per hour in normal cold weather.

### Registers and Grilles

A feature which appealed to the owner was the elimination of un-  
(Continued on page 40)



Right is the piping plan for the house. Three supply mains with numerous short branches are used. The furnace occupies the least desirable space. All ducts are placed high enough to give plenty of head room. Note how many risers occupy outside walls

— BASEMENT PLAN —

# ESTIMATING VS GUESSTIMATING

(Part I)

By S. T. MAYTER

THE widespread interest in air conditioning installations now being shown by the smaller sheet metal shops, has revealed a number of owners and estimators who figuratively tremble in their boots when asked to submit a figure on either a home conditioning installation, or one designed for industrial purposes.

Sometimes the more courageous take "a shot at it," with disastrous results. More frequently, however, contractors unfamiliar with this type of installation regretfully pass up the opportunity to secure an attractive job, because they lack a dependable method or guide for estimating.

This article, and those to follow, outline a plan and all necessary forms offered with the assurance that they have been tried and tested on some of the largest ventilation installations in the city of Chicago. These forms and the method outlined are sufficiently flexible to accommodate themselves to smaller installations, without being cumbersome. The method is as near "forget-proof" as it is possible for anything having to do with estimating in the contracting game can be.

### Follow a Plan

Any ventilating or air conditioning installation worthy of the name should have an adequate set of plans and specifications. Let us assume that the ambitious estimator has secured a set of these plans and specifications and is itching to submit a bid on the job, in spite of the fact that the job looks a bit more formidable than those he is familiar with.

The first thing he should do is read the specifications. That means

READ them, not glance through them. He should note such items as are not entirely clear to him, any conflicting statements, or as sometimes happens, actual mistakes. He should next turn his attention to the plans, BEFORE he annoys the architect for additional information. It is surprising how frequently this careful examination automatically clears up confusing items in the specifications.

We will assume that this job is a simple ventilating installation, consisting of a supply and exhaust fan, together with the necessary intake, coils, housing, filter, mixing and bypass dampers, ducts regulation, grilles, motor, starters, belts, discharge hoods, covering, and all the other elements of a good installation.

If these plans are plans and not a "rough idea," they will give the estimator a mental picture of the installation so clear that he will be

ready for the next step, which is the take-off. If, however, there is any doubt concerning the items he has listed, he should now call or visit the architect and secure an interpretation that will enable him to quote on exactly what the architect has in mind.

With the duct "take-off" form before him the estimator should fill in all the top lines. Then starting at the intake louver put down its dimension and whether or not is to be painted.

### Typical Example

To illustrate, take a simple system. Let us assume the intake duct is 30x60 inches. Put that down in the first column. Thirty inches times 60 inches equals 15 square feet per linear foot. Put that down in the second column. This intake is to be covered and painted. Put a "P" and "C" in the third column. The in-

(Continued on page 43)

DUCT TAKE OFF *Tasty Sandwich Shop* DATE *1-7-32*

ARCHITECT *Harris & Ellis* ENGINEER *Geo. B. White* SHEET NO. *1*

*12" X 1/2" IS on ducts 24" & over on 4" Center*

SIZE DUCT	IN. X IN.	GA.	LINEAL FEET DUCTS	24 GA	22 GA	20 GA	18 GA	16 GA	14 GA	12 GA	10 GA	8 GA	6 GA
<i>30x60</i>	<i>15</i>	<i>P</i>	<i>Intake Louver 48x60</i>										
		<i>C</i>	<i>25</i>										
		<i>P</i>	<i>Heater Coating</i>										
		<i>P</i>	<i>Filter &amp; Fan connection</i>										
<i>30x20</i>	<i>8.3</i>	<i>P</i>	<i>15</i>										
<i>24x18</i>	<i>7</i>		<i>30</i>										
<i>18x12</i>	<i>5</i>		<i>30</i>										
<i>30x36</i>	<i>11</i>	<i>P</i>	<i>15</i>										
<i>30x18</i>	<i>8</i>		<i>30-30 (60)</i>										
			<i>Total #</i>	<i>150</i>	<i>91.5</i>	<i>165</i>	<i>65.5</i>	<i>66</i>					
			<i># Requiring Angles</i>	<i>815</i>	<i>165</i>	<i>655</i>	<i>66</i>						
			<i>41701425</i>										
			<i>16</i>										
			<i>10</i>										
			<i>20</i>										
			<i>425 Linear feet IS Required</i>										

This is the duct "take-off" sheet which has proved as nearly forget-proof as anything yet devised by the ventilation fraternity. When completed every item is accounted for, even small branches.

# FUNDAMENTALS OF HEATING

By G. A. VOORHEES

**W**HILE it is not necessary for us to carry a mass of definitions in our minds (such as that of the B.t.u., the degree Fahr., etc.), we should have precise definitions and detailed explanations *available for reference* whenever they may be needed—and they will be needed at times. Therefore, it is quite desirable that every serious student of warm air heating—and we are all students if we are keeping abreast of the rapid developments of this science—it is quite desirable that we have (1) at least a small library of practical books on heating and ventilation, (2) a carefully preserved file of trade journals because of the valuable news they contain relating to the current developments in heating, and (3) a note book for recording important items of information that we acquire from various sources from time to time.

## Conduction

In addition to the heat content of substances which has been mentioned only briefly at this time, we need to consider heat transfer. Heat is transferred or conveyed from place to place in three ways: (1) by conduction, (2) by convection and (3) by radiation. In any of these cases it tends always to "flow" from a point of higher temperature to a point of lower temperature.

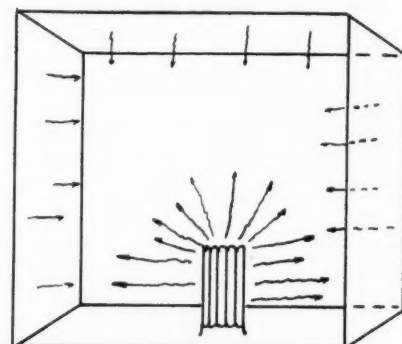
Thrust one end of an iron bar

into a hot fire, holding the other end of the bar in the hand. The hand soon becomes warm, then hot. The intense heat of the fire has increased very rapidly the rate of vibration of the iron molecules in one end of the bar and this vibration has been transferred by contact from molecule to molecule throughout the length of the bar and from the bar to the hand and we say that heat has flowed from the fire to the hand *by conduction* through the iron. Place the hand in contact with a cake of ice and the hand becomes chilled because heat is flowing from the point of higher temperature (the hand) to the point of lower temperature (the ice).

Substitute a wood rod for the iron bar and the end in contact with the flame will ignite and burn at a temperature of about 800 degrees Fahr., but the other end of the rod will not become perceptibly warm to the hand.

The iron transmitted heat rapidly, the wooden rod quite slowly. Metals in general are good conductors of heat and wood is a poor conductor. Wood is therefore a better building material than iron or steel from the standpoint of retaining heat within the building in winter and preventing its entrance in summer.

Air is also a non-conductor of heat and the heat insulating effi-



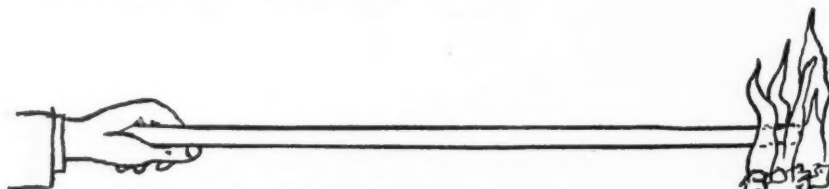
If a hot radiator is placed in the center of a room heat will be given off in every direction. This heat is radiant heat. The peculiar thing about radiant heat is that the air surrounding the radiator is not warmed by the radiant heat waves. But when these heat waves strike the walls, the walls are heated and the air gets its heat by rubbing against the walls

ciency of asbestos, cork, fibre boards and insulating blankets is due largely to the innumerable air pockets contained within the material.

## Convection

*Convection* is the transfer of heat from place to place by means of a circulating medium, either liquid or gas. In a hot water heating system, water is the circulating medium. It absorbs heat by conduction from the hot surfaces of the heater and carries this heat by convection (circulation) to the various radiators where it gives it up by conduction to the metal of which the radiator is composed.

In a warm air furnace system of heating, cold air enters the bottom of the furnace casing and the cool air particles come momentarily into intimate contact with the hot surfaces of the furnace body. While briefly in contact, these particles receive heat by conduction from the hot metal. Then they move away from the surface to be replaced by a continuous stream of cool parti-



If you hold an iron bar in a flame, the end in your hand quickly gets hot. Heat has traveled through the bar, conducted from molecule to molecule. If the bar is wood, the end in your hand probably won't get hot. Hence iron is a good conductor of heat and wood is a poor conductor

cles which in their turn pick up heat by contact (conduction).

### Heat Transfer

The hot air particles leaving the heating surfaces of the furnace carry with them the heat they have absorbed by contact. This heated air passes up through the leaders to the rooms where the reverse process takes place. In fact the loss of heat by the air begins just as soon as the particles leave the hot furnace body and we find that the temperature of the heated air which may be 200 degrees Fahr. at the furnace bonnet, has dropped to say 150 degrees by the time it reaches the register.

Having reached the room at perhaps 150 degrees, it comes into close contact with room air particles and by the time it has traveled from the register to a point at the ceiling directly above the register, its temperature will have dropped to 100 degrees or less. In its circuit through the room from the warm air inlet to the return air outlet, its temperature has dropped from 150 degrees to 65 degrees and this temperature drop represents mostly a loss of heat by conduction (contact). The entire process: absorption of heat by conduction from the hot surfaces of the furnace, the carrying of this heat to the room

by circulation and giving it up to the room air, walls, floors, and furnishings by conduction (contact) constitutes the process of heating by convection.

### Radiation

Radiation is the flow of heat through space, supposedly by means of wave motions in the ether. Radiation from a heated body travels outward in straight lines until intercepted by another body. The quantity of heat given off in a unit of time by the radiating body depends, among other things, on the difference between the temperatures of the radiating and receiving bodies. Radiant heat may be either absorbed or reflected by the receiving body in which respect the heat rays behave like light rays. There are a number of laws of radiant heat which are of no great practical value to us in our daily work and they will not be discussed here but may be found in any standard text on physics by any reader who wants a more complete knowledge of the subject.

(One of the laws of radiant heat is of more than passing interest to us, however. It is the fact that a dull, rough surface radiates heat better than a smooth, bright surface. It is this particular law of radiant heat that accounts for the fact that the heat loss from a leader

pipe covered with one thickness of 10-pound asbestos paper pasted tightly to the pipe, is about 60% greater than the loss from a bare tin pipe.)

### Heat Loss

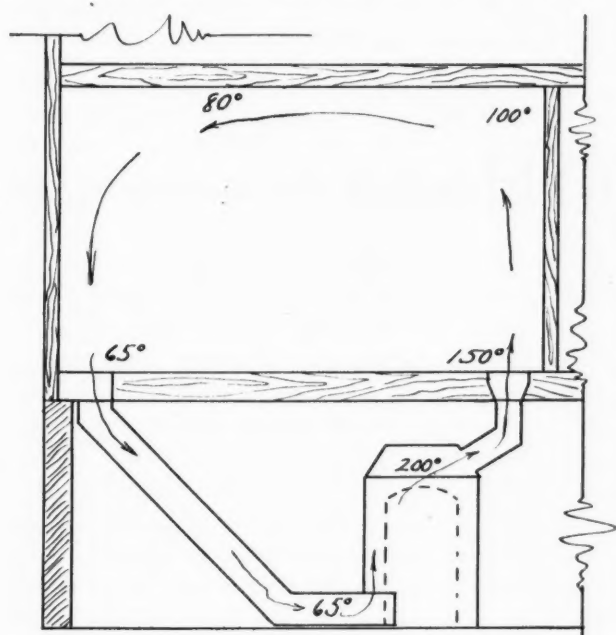
Our present interest in the three methods of heat transfer, conduction, convection and radiation, centers in their effect on the loss of heat from buildings. If the temperature of air within a given room is at 70 degrees and if there is no loss of heat from the room, the air temperature will remain at 70 degrees indefinitely. This condition would exist so long as the temperature of all spaces surrounding the room was also 70 degrees. But if the outdoor temperature drops to 69 degrees, heat immediately begins to flow outward until the room temperature has dropped to that of the outside temperature and a "heat balance" between inside and outside has been established. Furthermore the loss of heat from a room or building is directly proportional to the difference between inside and outside temperatures.

It is this loss of heat from the building that our heating plant must replace to maintain the desired inside temperature. Hence, the vital importance of calculating heat losses accurately. This loss which is expressed in terms of "B.t.u. per hour" occurs in two ways: (1) by transmission through exposed boundaries of the room and (2) by leakage (infiltration) of cold outside air into the room.

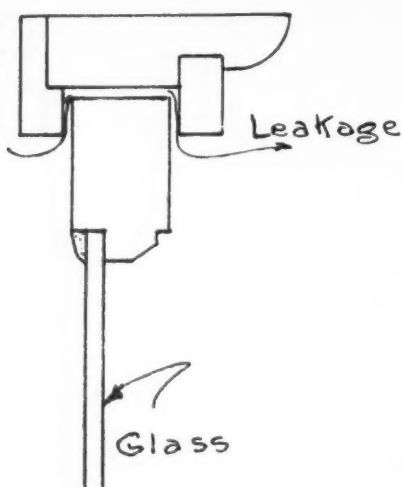
The greater of these is the transmission loss which takes place by conduction and radiation through and from:

- (1) Glass surface (windows, skylights, outside doors).
- (2) Exposed wall surface (outside walls).
- (3) Ceilings (if the space above is unheated).
- (4) Roofs.
- (5) Floors (if the space below is cold).
- (6) Inside partitions (if the adjoining spaces are cold).

The lesser of the two losses is



Convection heat, popularly known as warm air, is the method by which the air stream carries heat units into a room. Each unit rides a fluid unit just like you ride a horse. When these riders come in contact with cold air units a transfer is made and we have warm air heating



Air leaks into rooms by seeping through cracks like this at the top, sides and bottom of a window. There is a method which can be used to calculate just how much this leakage amounts to

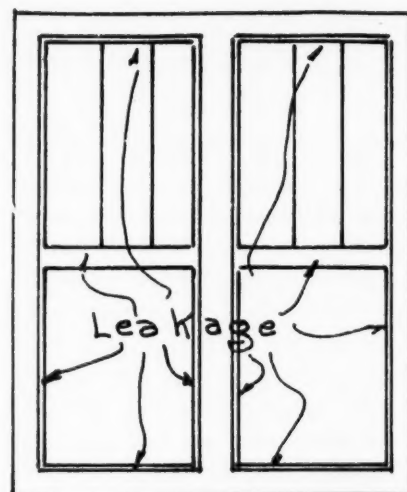
the infiltration loss. It is caused by the inward leakage of outside cold air into the building on the windward side and the outward leakage of an equal volume of warm, room air on the leeward side. It is a convection loss inasmuch as the cold air enters, absorbs heat and carries this heat away as it leaves the building.

The infiltration loss can seldom be as accurately gauged as the transmission loss because leakage depends on wind velocity which is quite variable and on the tightness of the building construction which is frequently an unknown factor.

There are two accepted methods

of estimating air leakage in computing heat losses. The more commonly used in warm air heating work is the "cubic content method" by which the amount of air leakage in the rooms of a residence is assumed to be from one to three times the cubic volume of the room per hour. The "crackage method" which gauges air leakage according to the number of running feet of crack around windows and outside doors, is considered more accurate by many engineers but its accuracy depends upon a definite knowledge of wind velocity and of the width of crack (which is quite variable) around windows and doors.

These methods will be considered in greater detail in a later article dealing with infiltration and for the present it is probably sufficient to roughly estimate air changes due to leakage according to the accompany-



On any window heat is lost by transfer through the glass and through cracks around the windows if the window is on the vacuum side of the house. Every crack, no matter how small, lets valuable heat units through

ing table which is widely quoted by authorities.

**Table of Air Changes Due to Leakage  
Under Average Conditions**

Room or Building	Air changes per hour
Rooms with 1 side exposed.....	1
Rooms with 2 sides exposed.....	1.5
Rooms with 3 or 4 sides exposed.....	2
Rooms with no windows or outside doors.....	$\frac{1}{2}$ to $\frac{3}{4}$
Entrance halls .....	2 to 3
Reception halls .....	2
Living rooms and dining rooms.....	1 to 2
Bathrooms .....	2
Drug stores .....	2 to 3
Clothing stores.....	1
Churches, factories, lofts, etc.....	$\frac{1}{2}$ to 3

## Warm Air in a \$35,000 Home [Continued from Page 36]

sightly radiators through the use of warm air. This feature has been further emphasized by using flush baseboard type return air grilles and low wall registers as shown in the photographs. The registers are placed flush in the plaster and installed with a prime coat only. After the papering was applied, the faces were painted to harmonize with the color scheme of the paper and the room. The grilles were also installed in the prime coat and painted

to match the woodwork.

In connection with the air faces the plan also shows that several faces are located in outside walls to expedite duct work and also meet special room requirements.

The recreation room in the basement is supplied with air through a high side wall face. Return air is taken out of this room to insure complete circulation through a grille face located at the floor line.

All registers were installed with

valves so that supply can be shut off, but the valve was removed from the grilles so that there will be no cutting off of return to the furnace.

Through close co-operation between owner, architect, the engineering department of the furnace manufacturer and the installer all special problems of location, design and room use were thrashed out before the complete design was prepared so that no problems were left to be handled at installation time.

# ...the Problem Corner

## Do Unexcavated Areas Kill Air Flow?

Followers of the "Problem Corner" were given a request in the March 28 issue in which a contractor had a heat pipe which doesn't work. He feels that the trouble lies in the fact that a part of the run passes through an unexcavated area.

Here is what he says—

"Three leaders from the furnace pass through a heavy rock wall which surrounds the basement. Beyond this wall the area under the house is unexcavated. The leaders pass through a hole in the wall through a thimble giving at least 1 inch of air space all around the pipes. This thimble is plastered into the wall.

"Two of the pipes do fairly well, while the third pipe, which supplies the bathroom, fails to deliver. All three pipes are covered with two layers of 12-pound asbestos paper and also a wrapping of corrugated asbestos paper.

"Just what exactly is the insulating value of the wrappings described and should the bare pipe have less loss than the pipes which are covered?

"The leader to the bathroom passes through one partition wall, then through a cold fruit cellar and then through the rock wall described. Just beyond the wall the leader turns up through the floor of the room above, through this room to the ceiling, through the ceiling and into a floor register in the bathroom above.

The leader through the first floor room is bare and hugs the wall. The pipe turns out at the ceiling to the register boot.

"What I want to know is—does an unexcavated area slow up the flow of warm air in pipes going through such an area, and if so, what protection can be given the pipes so that the runs will work?"

An interesting reply to this

problem is given by Platte Overton, who says—

**Platte Overton, Chicago**

Unexcavated areas do kill air flow unless the warm air pipes are well insulated. This means that we must have at least 1 inch of efficient insulation such as is used on steam or hot water pipes.

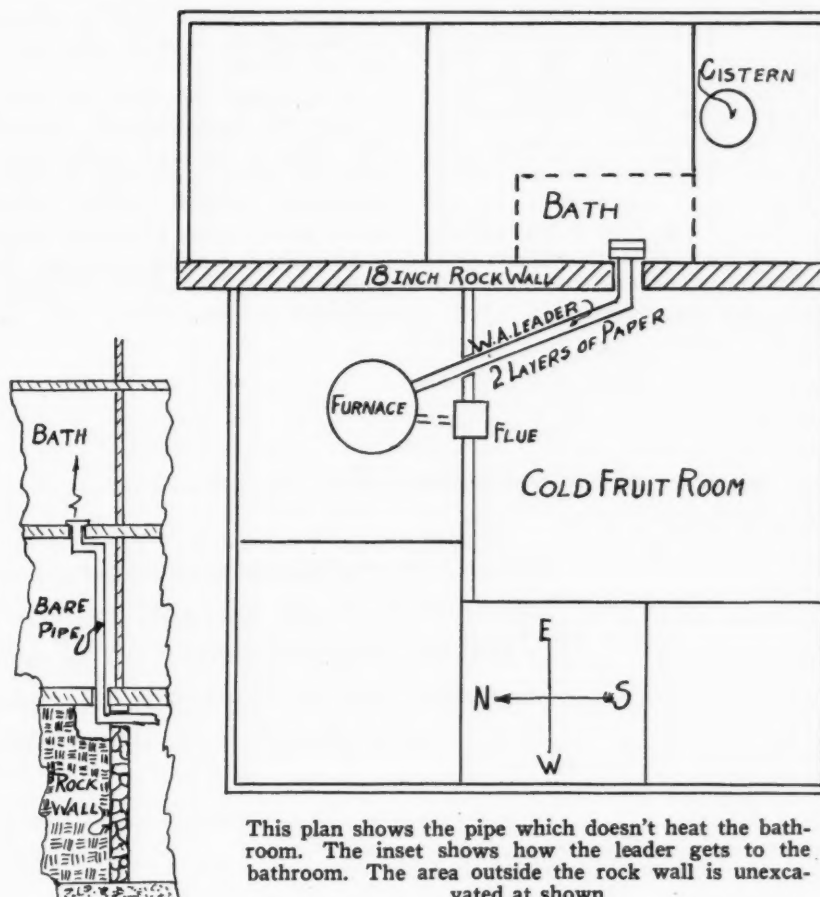
The velocity in gravity warm air pipes increases with the temperature and it is highly important that the air be kept at as high a temperature as possible.

If the elbows and boots on this run

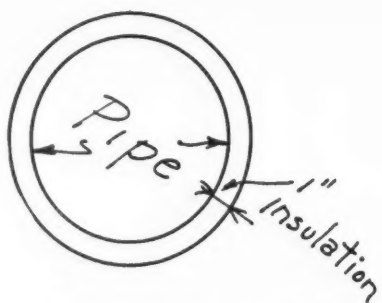
are of the frictionless type and well designed, no trouble should be experienced in getting warm air to this bathroom. I assume, of course, that the leader, stack and register are the proper size for the requirement.

Runs of this type must be given every advantage possible. Warm air with a gravity flow develops but little pressure or velocity, and this may be stopped by a mere cobweb. The temperature must be maintained.

I believe the real trouble may develop at the elbow at the base of the stack. No doubt this area is very cold, due to the cold fruit room. Give this



This plan shows the pipe which doesn't heat the bathroom. The inset shows how the leader gets to the bathroom. The area outside the rock wall is unexcavated as shown



Pipes must be insulated fully or the insulation is worse than no insulation at all. Use at least 1 inch for pipes through unexcavated areas

particular part of the duct a careful inspection and see that it is well insulated.

The average bathroom has a heat loss of 4,000 B.t.u.  $4,000 \div 62 = 65$  cubic feet of air per minute at 135 degrees to keep this room warm. If this run is 9 inches in diameter we have 9 inches = .44 square feet area, and at an average velocity of 125 feet per minute we have  $.44 \times 125 = 55$  c.f.m. So you see that we must carry the temperature in this room very high.

Make an inspection of the outside basement wall above grade and see that there are no leaks or opening to allow the cold air to blow on this run.

The sketch above shows a very common defect found in hot water systems. In fact, it is so common in these days of poor masonry that this is generally the first place the steam-fitter looks for trouble. Such a situation will kill an entire hot water run. The same would be true of a warm air leader.

This run will have a temperature drop of about 18 to 20 degrees; thus the bonnet temperatures must be 150 degrees for the proper results.

### C. F. Malone, Utica, N. Y.

Another answer bringing pertinent information on this problem comes from C. F. Malone of Utica, N. Y. Mr. Malone says:

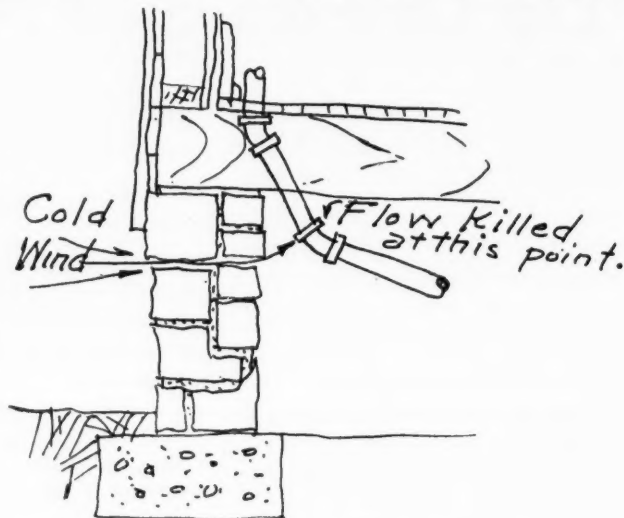
Answering your question, "Do Unexcavated Areas Kill Air Flow," we answer YES, most assuredly, and our experience has been not to temporize with them at all, but to make sure that the pipe is thoroughly insulated, also to make sure that there is no draft to play around the outside of the heat

less it is well butted together, cover the pipe through the cold cellar and to a point just under the floor.

The next move is to have the owner build a false wall in behind the opening in the unexcavated part, and build this tight from the ground to the floor so that no air can get through to chill the pipe, and we can gamble that this pipe will heat as well as any other. There is no mention made as to the length of this pipe; if it is extremely long, I should increase it one size.

About the insulation described, no one can tell of what value it is, safe to

Hot water men have learned that a supply pipe passing near a cold, leaky wall is practically useless as a leader. The same applies to warm air leaders. Test such walls for leakage by passing a match or lighted candle all over the wall



pipe. Ratings on all heating apparatus should be like the rating on a steam or hot water radiator, "Viz" in still air, just so with the warm air pipe, make sure it is in still air.

To accomplish this, cover the warm air pipe with  $\frac{3}{4}$ -inch air cell covering (the same as used on steam pipe), cover the elbows to the same thickness with plastic asbestos covering, which is very good, but not as efficient as the  $\frac{3}{4}$ -inch air cell, butt the joints tight together as they will expand somewhat with heat, and will leave a crack, un-

say it is of very little value, and we believe the pipe would heat just as well bare.

Make sure that there is no air that can circulate around the pipe where it goes through the wall. A good material to stop this is the plastic asbestos mentioned before.

There may be many ways to cure this particular run, but this one has been used by the writer for quite some time, and has proved very satisfactory.

Yours truly,

C. F. MALONE.

Whenever you bump up against a problem which falls outside your personal experience, send it to the "Problem Corner." You will then have the experience of thousands of readers, many of whom have already solved a similar difficulty

# Sell Radiator Covers This Spring

**M**ODERNIZATION has been the big selling field for all the building industries during the past two years. This movement to get repair and replacement work has been pushed by warm air heating and sheet metal contractors with good success. Without exaggeration we may say that modernization, for the heating industries at least, has shown larger percentages of profit than new construction as practiced just prior to the decline in building.

Now the sheet metal contractor has entered the specialty field and turned the facilities of his shop to the fabrication of numerous items which bring excellent profits once the market has been established. Such sheet metal specialties cover every conceivable field of industrial and domestic use.

One sheet metal fabrication field which is finding increasing activity is the manufacture of radiator covers. There was a large boom in radiator covers during the last five years, with dozens of manufacturers entering the field and advertising their product. Within the last year many of these manufacturers

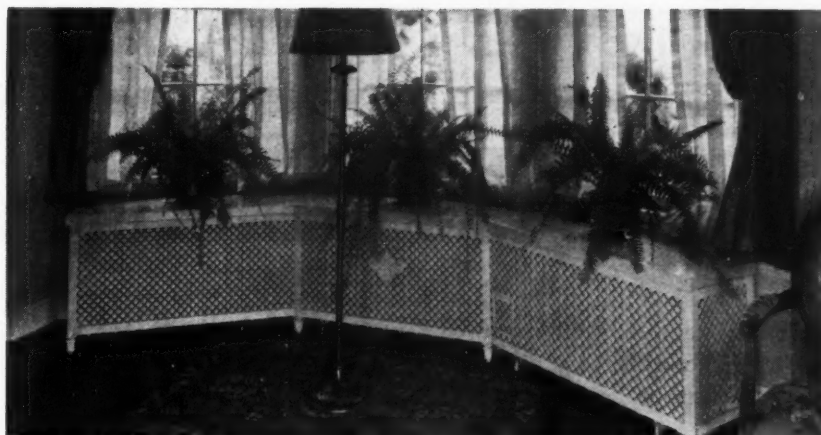


Photo by Courtesy of Harrington & King Perforating Co., Chicago

have dropped out of the picture, leaving the fabrication of this item to the sheet metal contractor.

There is no denying that people want their radiators hidden. They want the cover to harmonize with the color scheme and decorations of the room. The sheet metal fabricator has the advantage of the manufacturer in meeting this demand for harmonization because he can select from a wide line of metal designs and can paint, or enamel, or finish his cover exactly to the owner's wishes. Many of these metal designs, and the necessary sections to enclose the panels, can

be bought as standardized parts, thus saving time and money.

The home decoration period of the year is here. This spring will see thousands of home owners spending money for just such things as covers to hide unsightly radiators which will be useless for the next six or seven months. The sheet metal contractor looking for shop and sales activity may well consider this particular specialty as a means of making money, for contractors report good profits, especially for the cover which demands sizes and designs which can not be duplicated in standardized covers.

## Estimating vs Guesstimating [Continued from page 37]

take runs from the first floor ceiling to the basement floor, a distance of 25 feet. Put that down in the next column. After listing the coil casing and the plenum chamber, proceed with the ducts, listing them in this manner. Similar sized ducts can be listed in the fourth or widest column, and totaled when the take-off is finished to prevent unnecessary duplication of calculations.

When the take-off is finished, refer to the clause in the specifications that lists the gauges for the different sized ducts. Enter these governing dimensions and the gauges at the top of the columns at the right of the sheet. Then, under each

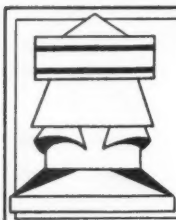
proper gauge heading, list the total square feet of each entry, which is the product of the second, times the total of the fourth column.

If you determine your cost on the square foot basis, the total of these columns is the figure you will use for your shop and field cost. If, however, you figure jobs on the pound basis, the total of these columns times the weight per square foot of the various gauges will give you the total weight of the sheet iron of the various items.

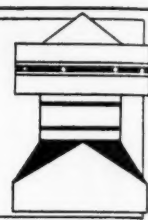
Our specifications call for angle iron stiffeners on four-foot centers, on all ducts 18 inches and larger. A quick method of determining the

total length of these angles is to take the total square feet of duct surface of all the ducts whose dimension is 18 inches and larger, and divide this amount by 4 to give the total length of the required angles.

We are now drawing near the end of the take-off. There remains the listing of the dampers, diffusers, splitters, grilles or registers, hoods, sleeves, access doors, and any special items peculiar to the installation. Up to this point, we have purposely refrained from mentioning the equipment, and how to handle this item in the estimate. We will discuss this important feature in the next installment.



# GRAVITY EXHAUST VENTILATION



## Residence Ventilation—Cooling

**T**HE best method of cooling a residence during a hot summer depends a good deal on the residence and how much money the owner is willing to spend both on the cooling system and on its operation. There are many reasons to believe that refrigeration systems similar to those installed in theaters can be installed in private residences but these refrigeration systems as we know them are, of course, too elaborate and expensive both in initial cost and in operation to be applied to a small residence. We all know, however, that smaller and simpler systems are now coming on the market.

The cheapest method of cooling today is with cool air, if cool air is available. Immense quantities of air may be handled at an almost infinitesimal cost, and while each cubic foot of air absorbs only a little heat, the immense volume of air handled by this means gives a cooling effect which is very economical and very noticeable.

Next to cooling by air, the cheapest means of cooling is by water, where cool water is available, but this is necessarily more complicated and more expensive than air cooling. The water requires plumbing and pumping, in addition to air movement to distribute its effect.

Whether or not it does any good to operate a furnace fan is a question which is now being discussed on all sides. There is unquestionably some benefit to be derived from stirring the air within the house if this same stirring brings the heated air down from the ceiling and

By PAUL R. JORDAN\*

AMERICAN ARTISAN

Chicago, Ill.

Gentlemen:

What is the best means of cooling a residence during the hot summer? Does it do any good to operate the furnace fan?

Some furnace companies claim that their systems cool in summer as well as heat in winter. How about air washers?

The air in the basement is usually cooler than that in the house. Can this be used for cooling the house?

(Signed) Ventilation Dept.  
Reader

mixes it with the cooler air at the floor, or cooler air from outside. There is also the increased evapo-

rative effect which comes from moving air.

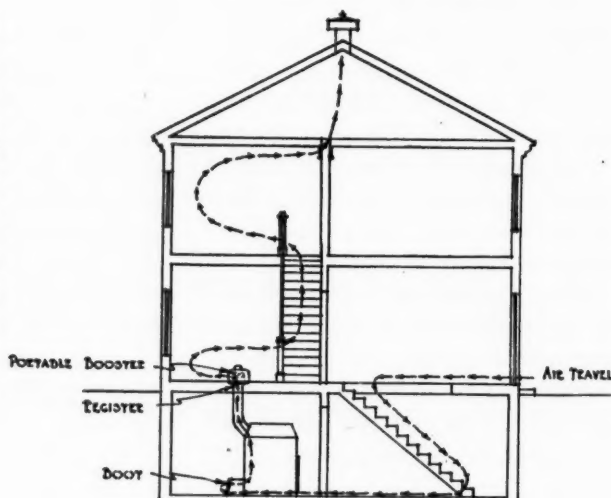
One trouble is that a heating system is designed for heat distribution and not for heat dissipation.

Drawing cool air from the floor is fine for heating, and stirring the air to bring down warm air from the ceiling to the floor also is fine for heating. But for cooling this process must be reversed, and it is hard to reverse a heating system installed for heating purposes.

With air washers, you unquestionably can cool the air, but while you are cooling the air, you are introducing moisture into it and bringing up the humidity unless the water supply is controlled or cooled. In order to bring about comfort during hot weather, you must not only cool the air but you must bring down the humidity. Anything which adds percentage to the relative humidity is as bad as anything that adds degrees to the temperature.

COOLING A RESIDENCE WITH NIGHT AIR AND BASEMENT AIR

The drawing shows approximately how a gravity ventilator in the roof, coupled with a small fan above or in the furnace shoe will set up a continuous exhaust out the top drawing cooler air up from the basement. The total effect, however, does not nearly equal a mechanical cooling system



Air washed and then dehumidified must be the system used for summer.

Lately considerable publicity has been given to the proposition of using basement air, but the difficulty is that the amount of coolness available is quite limited. The basement is cool because there is no heat introduced into it either by heating elements or by hot outside air. But if on a hot day you pull the cool air out of a basement, heated air takes its place, and soon the basement is hot.

In the hot countries, housewives keep their houses cool by opening them up during the night, then with the coming of the day, closing them up against the entrance of the heated air, and curtaining against the sun's rays. This seems to be

successful, especially where houses are built with heavy masonry walls.

A very practical and low-priced method of cooling the average American residence is with attic and sleeping room ventilation. Hot attic air should be exhausted at the high point of the attic. Sleeping room ventilation for cooling should consist of an exhaust register at the ceiling of each sleeping room, exhausting from the top of the room into the attic above. Such a system will get rid of the heat.

If the attic exhaust is a gravity ventilator, the action will be slow, but continuous. By throwing everything open wide at night, advantage can be taken of the cool night air. Then, by closing doors and windows, and curtaining off the rooms during the day, but leaving the ex-

haust ventilation open, the interchange will be slowed up so that only a small amount of warm air will be taken in from the outside, while the hottest air is given a chance to get out from underneath the ceiling and the roof.

If the basement is quite cool it may be practical to set a portable booster over one of the registers or use a pipe booster and with it pull a small amount of basement air into the room. An opening made in the boot at its low point will feed the coolest air to the booster for delivery into the room. If the basement is closed up so that the air to replace that withdrawn will drift from indoors, down the basement stairway, it is possible that the coolness of the basement can be utilized to some advantage in *one* room.

## Soldering the Stainless Steels

By V. W. WHITMER

*Welding Engineer, Republic Steel Corporation*

**I**N soldering any metal it should be remembered that the joint is one of surface adhesion only and not an alloy of one metal with another metal, such as a weld or fusion. Rough surfaces present numerous fingers or projections which give the solder something to hold to. Hard, smooth or polished surfaces, on the other hand, supply no means for anchorage. Consequently, such joints may be weak. Hard, stiff materials if deformed after soldering, will put more strain on the joint, as it will probably be the softer of the two materials. Rupture may occur. Soft materials, like copper, will bend easily after soldering, as the joint is just as strong as the sheet, if not more so. Here failure is very infrequent.

Because stainless steels are stiff metals, it is necessary to make the joint mechanically strong in itself, if any particular load is to be carried. Joints should be lock-seamed, riveted, or otherwise strengthened depending on the solder primarily

as a seal, or in some cases, a fillet.

In making such joints, if very smooth or polished sheets are used, the edges should first be roughened with a coarse file or emery wheel. If this is impossible, a mixture of 50 parts Ferric Chloride in 100 parts Muriatic Acid and diluted two or three to one should be applied to the surface with an acid swab and allowed to set for 10 to 15 minutes. The mixture should then be carefully removed so that it will not touch elsewhere on the sheet. This method will etch the surface sufficient for tinning. No such preliminary treatment is necessary if rough pickled sheets are used. A good stainless steel soldering flux is then applied the same as cut acid and the edge tinned, using ordinary commercial half-and-half solder. After tinning, wipe off all excess solder, leaving only a fairly thin

film. In the case of a lock seam, tin both sides of each piece.

After tinning the joint should be lock-seamed, riveted or properly strengthened by other means. Then, using either the same flux as before or cut acid, sweat the joint with more solder, the same as if working tin, terne or any other tinned product. No precautions need be taken with the irons other than those employed in everyday practice. In view of this a larger iron will be beneficial, as it will supply more heat for running a longer seam without the detrimental effects from warping caused by too high a temperature. If special analysis solders are required the same procedure should be followed. Do not have the irons any hotter than necessary, otherwise warping or buckling will result.

After completion of the work, all the joints and preferably the entire job should be washed with a solution of soap and 5-10% soda to neutralize any acid. Rinse with clean water and wipe with dry soft cloth.

# ASSOCIATION ACTIVITIES



## 1932 Program of Research Residence Announced by Committee

The University of Illinois work on air filters is to consist only of the determination of the resistance that the filter offers to air flow in a forced-air heating system. The following test procedure has been outlined:

- (a) Operate the present forced-air system without filters and determine the static pressure loss for the system.
- (b) Repeat with clean filters installed.
- (c) Repeat with dust-laden filters and note change in resistance of filters.
- (d) Repeat tests with air washers in place of filters.

### 2. Air Washing and Humidification.

- (a) The Advisory Committee has recommended the installation of an evaporation pan in the bonnet of the present forced-air plant.
- (b) The test on air washers is to include:
  1. The determination of the resistance at rated capacity of washer used.
  2. The determination of the amount of humidification attainable with water at the temperature prevailing in the local water mains.

### 3. Furnace Tests.

- (a) The Research Staff has indicated that, due to variations in temperature and air weights through the furnace system on intermittent fan operation, a determination of the furnace capacity at the bonnet cannot be obtained with any degree of accuracy. The overall house efficiency and fuel consumption, however, can and will be obtained under actual operating conditions.
- (b) The performance characteristics of the furnace and distribution of air temperatures in the furnace bonnet are to be determined with continuous fan operation for the following conditions:
  1. Variations in bonnet height.

2. With and without baffling in furnace casing.

- (c) The determination of similar performance characteristics for a steel furnace has been recommended.
- (d) It has been recommended that tests be made on different sizes of the present type of furnace in the same forced-air plant with the purpose of establishing some simple basis for the determination of the minimum size of furnace required for forced-air plants. Such tests may also throw some light on the relation between capacity of a given furnace when used for gravity and when used for forced-air circulation.

### 4. Ducts.

- (a) The original "Outline of Procedure" is to be followed without change.
- (b) A study of the individual duct system is to be made after the completion of the work on the present trunk duct system in the Research Residence.
- (c) Data should be compiled at the earliest possible date for the preparation of a pamphlet on air ducts, casings, and bonnet details for the guidance of the installer.

### 5. Warm Air Registers.

The work as outlined in the "Outline of Procedure" will be carried on without modification.

### 6. Blower.

The determination of the maximum tip speed and outlet velocity for operation of the fan without obtaining noticeable air noise can be obtained on the present fan installation at the Research Residence by varying fan speeds. Pulleys are to be changed.

### 7. Controls.

A study of the methods of control required to eliminate stratification, with the resulting "cold 70," was considered desirable. The selection and location of

automatic control equipment has been left to the discretion of the Research Staff. Methods suggested are:

- (a) Low limit control in leader pipe without use of furnace thermostat.
- (b) Change in location of room thermostat.
- (c) Stack limit control in smoke flue pipe to prevent over-runs in combustion process.

### 8. Summer Cooling.

Professor Willard reports that the A. S. H. and V. E. has authorized the Committee on Research to co-operate with the National Warm Air Heating Association in the investigation of room cooling to be started this summer in the Research Residence. A project to determine the heating load in individual rooms has been approved by the A. S. H. and V. E., but final action has been deferred until a more detailed estimate of cost can be prepared and presented to their Committee on Research.

### 9. House Plans.

Publication of seven suggested layouts for the forced-air heating system for the Research Residence submitted by Association members has been deferred.

### 10. Insulation Tests.

A complete report of tests on the insulation value of a new form of sheet asbestos pipe covering, together with additional data secured previously on different types of insulation, is to be included in a future report by the Engineering Experiment Station.

## Cost Checking System

(Continued from page 21)

estimate the annual hours somewhat as follows:

Proprietor—20 hours per week or .....	1040
Man—36 hours per week.....	1872

Total estimated productive hours .....	2912
--	------

It is far more safe to underestimate the base on which overhead is spread than to overestimate. Of course, if the volume of work increases and overhead remains about as predicted, one can always change his basis for loading.

# News Items

## Form Robinson Heating & Ventilating Corp.

The Robinson Heating & Ventilating Corp. has been formed to take over the entire business of the A. H. Robinson Company of Massillon and Cleveland, Ohio.

This is a newly formed corporation and will have at its head D. A. Cable of Canton, Ohio, as President, and A. D. Sipp of Massillon, Ohio, as Secretary and Treasurer (formerly connected with the A. H. Robinson Company as Treasurer for a period of three years). Mr. Sipp will be the active member of the firm, having charge of its business affairs. The Board of Directors is made up entirely of men who have had a wide experience in manufacturing and marketing warm air heating products or similar products.

The new corporation is said to be well financed and has worked out all necessary improvements on the line of products. A sales policy will be announced to the trade within a short time. The products manufactured to begin with will include two grades of steel coal and coke furnaces made in all necessary sizes; two different types of gas furnaces, each made in six different sizes; three types of warm air booster fans all made in the necessary different sizes. In addition to these items, development work is rapidly progressing on the production of air conditioning equipment and ventilating equipment.

The main office and plant will continue to be located at Massillon, Ohio.

## Henry Ehret, Oakland Foundry Co., Dies

Henry Ehret, president and founder of the Oakland Foundry Company, Belleville, Ill., died March 4 at a hospital there, after an operation. He was 76 years old. Associated with him in the business, which he founded 26 years ago, were his three sons, Hugo, Edward and Ferdinand.

## International Company Awards Service Pins

One of the pleasant customs of the International Heater Company is the annual presentation, by the company's president, of service pins to salesmen and employees who have completed another five year term in the company's employ.

The names of those receiving new pins at the beginning of 1932, together with the years of service, follow: I. L. Jones, 35 years; L. J. Brien, 30 years; William Dunn, 25 years; C. A. Voter, 25 years; F. A. Healy, 20 years; F. R. Butters, 15 years; Charles Gangloff, Dan McCarthy, George W. Johnston, each 10 years; S. M. Rankin, John Steppens, H. V. Rogers, H. D. Cleary, E. H. Coates and G. W. Kenney, each 5 years.

## Galvanizing Campaign to Be Featured at Zinc Institute Meeting

An important feature of the 14th annual meeting of the American Zinc Institute will be a discussion of the Better Galvanizing Campaign recently organized by the Institute. The meeting will be held at the Statler Hotel, St. Louis, Mo., on April 18, 19 and 20, 1932.

During the past year the plan which was proposed at the 1931 meeting, for marketing a high grade, heavily zinc-

coated galvanized sheet under the "Seal of Quality" of the American Zinc Institute, has been put into effect, receiving the co-operation of many of the leading steel companies.

At the St. Louis meeting complete reports will be made by officers and field representatives of the Institute, showing the progress of this campaign. Representatives of the galvanizers will also attend, and the subject will be further discussed by representatives of distributors, dealers, consumers, agricultural extension departments, farm publications and others.

## Stibloy Compound to Be Produced and Distributed by Koppers Subsidiary

The Stibloy Products Company, Inc., with principal offices in the Koppers Building, Pittsburgh, has taken over the assets of Liquid Metal Products, Inc., Chicago, producers and distributors, under the Arent patents, of Stibloy.

Stibloy was developed to extend the life of galvanized surfaces by protecting them from the effects of atmospheric conditions and from the damage caused by exposure to gases, acid fumes, smoke and brine. It is used for protecting and preserving galvanized roofing, siding, sheeting, guttering, downspouts, air ducts, as a primer, not a paint.

Officers of the Stibloy Products Company, Inc., are: President, J. N. Forker; Vice-President, S. H. Bell; Secretary, John D. Shaner; and Treasurer, S. T. Brown.

Stibloy will be manufactured in the various plants of the Koppers Products Company and full information will be available at all district offices of the company.

## P. F. Gibbons to Represent Rudy in Chicago

P. F. Gibbons, 1121 North Karlov Avenue, Chicago, sales representative of the Rudy Furnace Company, Dowagiac, Michigan, after traveling Wisconsin for the past seven years representing the Rudy Furnace Company, will now take up the promotion of sales of the Rudy line in Chicago. Mr. Gibbons will handle their complete line of furnaces—gas furnaces, etc. He is well known in Chicago, having traveled the city prior to covering Wisconsin.

## Coming Conventions..

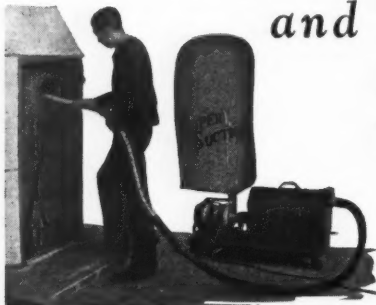
**American Oil Burner Association—April 11 to 16, at Boston, Mass.** Headquarters for convention, Hotel Statler, Boston. Secretary, H. F. Trapp, 342 Madison Avenue, New York City.

**American Zinc Institute, Inc.—April 18-20, inclusive, St. Louis, Mo.** Headquarters Statler Hotel. Annual meeting, Julian D. Conover, secretary, 60 East Forty-second Street, New York, N. Y.

**National Association of Sheet Metal Distributors—May 11 and 12, Philadelphia, Pa.** Annual meeting. Headquarters, Bellevue-Stratford Hotel. George A. Fernley, secretary-treasurer, 505 Arch Street, Philadelphia, Pa.

**National Warm Air Heating Association—May 18 and 19, at Deshler-Wallick Hotel, Columbus, Ohio.** Secretary, Allen W. Williams, 3440 A. I. U. Building, Columbus, Ohio.

## How He Sold TONS of REPAIR PARTS and TWELVE HEATING PLANTS



1932 Model, 1/2 H.P. plus, has 60% higher suction; safety trap which protects the fan from heavy objects drawn in; new style big bag; extra "suit case" bag, clean, for upstairs; plus other features.

H. A. Harmening, of Terre Haute, sold a \$196 replacement, on his very first cleaning job.

His first one hundred cleanings sold a dozen new plants, and several tons of repair parts.

Would you like to see the Plan Book which he used? It is free, and shows how he got his sales. And do you know how you can first try the good Super Suction before you decide to keep it? And then let it pay for itself? Easy.

Send this clipping, with your  
name and address on it, to

**The NATIONAL SUPER SERVICE Co.**  
1944 NORTH 13th STREET TOLEDO, OHIO

# "BB"

The mark of quality  
on sheet metal and  
roofers' supplies

## BERGER BROTHERS CO.

229-237 ARCH STREET, PHILADELPHIA, PA.

EAVES TROUGH  
GUTTER HANGERS  
CONDUCTOR PIPE  
CONDUCTOR FASTENERS  
MITRES  
END PIECES AND CAPS  
CONDUCTOR HEADS  
ORNAMENTAL STRAPS  
VENTILATORS, ETC.

## News Items . . . . .

### E. C. Dunning, Formerly with Mueller Furnace Co., Forms New Company

Ellsworth C. Dunning, who has been associated with the heating industry for the past 22 years, has severed his connection with the L. J. Mueller Furnace Co., where he served in the capacity of sales manager, and is forming a new selling organization which will be known as the Dunning Company. The new company will distribute furnaces, heating and air conditioning equipment and specialties. This new company will have its office and warehouse at 708 West Virginia St., Atlas Storage Company, Milwaukee, Wisconsin.

Some of the lines carried in stock will be Williamson furnaces and furnace fittings, Independent registers and grilles, Grand Rapids furnace cleaners, and repairs for Dunning furnaces.

### Inland Steel Announces Personnel Changes

H. C. Darby has been appointed district sales manager for the Inland Steel Company at their Kansas City, Mo., office. Mr. Darby has been a member of the sales force of the Kansas City office continuously since November, 1926. He succeeds the late Orville P. Blake, previous manager, who died in February, 1931.

Announcement is also made that Mark Hill has been appointed salesman in the Kansas City office.

### STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912,

Of AMERICAN ARTISAN, published bi-weekly at Chicago, Ill., for April 1, 1932.

State of Illinois, County of Cook—ss.

Before me, a Notary Public in and for the State and county aforesaid, personally appeared D. J. Hansen, who, having been duly sworn according to law, deposes and says that he is the Manager of the AMERICAN ARTISAN and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation) etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Engineering Publications, Inc., Chicago, Ill.; Editor, F. P. Keeney, Chicago, Ill.; Managing Editor, J. D. Wilder, Chicago, Ill.; Business Manager, D. J. Hansen, Chicago, Ill.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) Engineering Publications, Inc., 1900 Prairie Ave., Chicago, Ill.; F. P. Keeney, Chicago, Ill.; O. T. Carson, Chicago, Ill.; E. D. Winslow, New York, N. Y.; R. Herlov, Chicago, Ill.; C. L. Davis, Chicago, Ill.; E. G. Hutchinson, Chicago, Ill.; R. Payne Wettstein, Pittsburgh, Pa.; W. J. Osborn, Fairfield, Conn.; D. M. Kenney, Chicago, Ill.; D. J. Hansen, Chicago, Ill.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is ..... (This information is required from daily publications only.)

D. J. Hansen, Business Manager.  
Sworn to and subscribed before me this 25th day of March, 1932.

(Seal)

L. M. Dixon.  
(My commission expires September 14, 1934.)

### Air Conditioning to Be Exhibited at Century of Progress

How the average family may be provided with a better place to live at less cost; how all the furnishings, decorations and equipment that go into their homes can be made more attractive; how the most scientific appliances for reducing the housewife's labor can be furnished; how by means of modern heating and air conditioning the home can be made more livable both in winter and summer—these and scores of other things of vital interest to American families will be demonstrated in the Home and Industrial Arts Show of A Century of Progress Exposition—Chicago's 1933 World's Fair.

Plans are for eight modern homes demonstrating the uses of new materials and methods of construction. Already arrangements for the construction of four of the homes have been made.

Different housing problems which face different types of families will be dealt with in these dwellings. The task will be to see what can be done to provide better homes for less money for the majority of the people. Inside these houses everything that is new in decorative treatment, furnishing and equipment will be displayed by the makers of these products. The most recent developments in kitchen planning and devices, *refrigeration, heating, plumbing, air conditioning*, will be demonstrated—all in keeping with the theme and purpose of the particular home.

### New Literature . . . .

#### J. M. & L. A. Osborn Co. Price List

The J. M. & L. A. Osborn Company has issued its new March-April-May, 1932, Price List. This list may be secured from any of the company's three offices—1541 East 38th St., Cleveland, Ohio; 6578 Gratiot Ave., Detroit, Mich.; 64 Rapin St., Buffalo, N. Y.

This spring's price list is unusually complete and contains listings of all the company's hundreds of items sold to dealers and contractors.

Sheets of all materials, in all sizes, of all weights, are listed and itemized as to quantities carried and in which warehouse these stocks are stored. There is also listed all furnace fittings and supplies carried in the company's extensive stock. All these items are priced.

The company also announces in this price list that aluminum sheets will be carried, ready for immediate shipment.

There is, in this list, complete prices for the dozens of tool, accessory and trade items carried.

#### Peerless Diamond Grid

The Peerless Foundry Company, 1853 Ludlow Avenue, Indianapolis, Ind., will mail to interested contractors a small leaflet describing the company's Diamond Grid registers and cold air faces.

The leaflet shows illustrations of the items and also contains tables of sizes, capacities and finishes. Prices are also contained in the leaflet.

#### Power Squaring Shears Leaflet

The Niagara Machine and Tool Works, Buffalo, N. Y., has prepared for the trades a new booklet describing the company's line of squaring shears. The booklet can be obtained by writing the company.

In the booklet complete descriptions, accompanied with photographs, of the many machines for squaring sheets are shown and discussed. The booklet also contains information on knives, holddowns, gages, and mechanical details are shown. Each machine is also rated for capacity.

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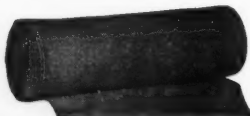
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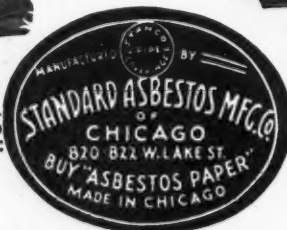
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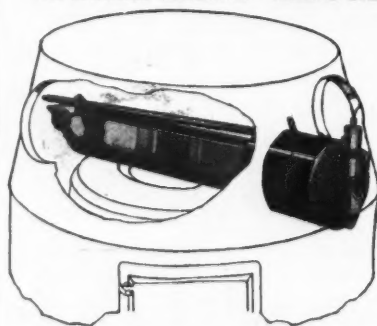
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## BUYERS' GUIDE

### AIR CLEANERS

American Air Filter Co., Inc.,  
Louisville, Ky.

### AIR WASHERS

Health Air Systems, Ann Arbor, Mich.  
Hess Warming & Vent. Co.,  
Chicago, Ill.

### ASBESTOS COVERING AND PAPER

Standard Asbestos Co. of Chicago,  
Chicago, Ill.

### BLAST GATES

Berger Bros. Co., Philadelphia, Pa.

### BLOWERS

Health-Air Systems, Ann Arbor, Mich.  
Hess Warming & Vent. Co.,  
Chicago, Ill.  
Henry Furnace & Fdy. Co.,  
Cleveland, Ohio

### BRAKES—BENDING

Dreis & Krump Mfg. Co., Chicago, Ill.  
Interstate Machinery Co., Chicago, Ill.

### BRAKES—CORNICE

Dreis & Krump Mfg. Co., Chicago, Ill.

### BRASS AND COPPER

American Brass Co., Waterbury, Conn.  
Revere Copper and Brass, Inc.,  
Rome, N. Y.

### CASTINGS—MALLEABLE

Fanner Mfg. Co., Cleveland Ohio

### CEILINGS—METAL

Globe Iron Roofing and Corrugating  
Co., Cincinnati, Ohio  
Milcor Steel Co.,  
Mil., Canton, Chgo., LaCrosse, K. C.

### CEMENT—FURNACE

Milcor Steel Co.,  
Mil., Canton, Chgo., LaCrosse, K. C.

### CHAIN—FURNACE

Hart & Cooley Mfg. Co., Chicago, Ill.

### CHAPLETS

Fanner Mfg. Co., Cleveland, Ohio

### CLEANERS—FURNACE VACUUM

Breuer Elec. Mfg. Co., Chicago, Ill.  
Brillion Furnace Co., Brillion, Wis.  
Densmore & Quinlan Co.,  
Kenosha, Wis.  
National Super Service Co.,  
Toledo, Ohio

### CONDUCTOR ELBOWS AND SHOES

Barnes Metal Products Co.,  
Chicago, Ill.  
Berger Bros. Co., Philadelphia, Pa.  
Globe Iron Roofing & Corrugating Co.,  
Cincinnati, Ohio  
Milcor Steel Co.,  
Mil., Canton, Chgo., LaCrosse, K. C.

### CONDUCTOR FITTINGS

Barnes Metal Products Co.,  
Chicago, Ill.  
Berger Bros. Co., Philadelphia, Pa.  
Globe Iron Roofing & Corrugating Co.,  
Cincinnati, Ohio  
David Levow,  
New York, N. Y.  
Milcor Steel Co.,  
Mil., Canton, Chgo., LaCrosse, K. C.  
Rival Strap Corp., New York, N. Y.

### CONDUCTOR PIPE

Barnes Metal Products Co.,  
Chicago, Ill.  
Berger Bros. Co., Philadelphia, Pa.  
Globe Iron Roofing & Corrugating Co.,  
Cincinnati, Ohio  
Milcor Steel Co.,  
Mil., Canton, Chgo., LaCrosse, K. C.

### COPPER

American Brass Co., Waterbury, Conn.  
Revere Copper & Brass, Inc.,  
Rome, N. Y.

### CORNICES

Globe Iron Roofing & Corrugating Co.,  
Cincinnati, Ohio  
Milcor Steel Co.,  
Mil., Canton, Chgo., LaCrosse, K. C.

### CRIMPING MACHINES

Bertach & Co., Cambridge City, Ind.

### CUT-OFFS—RAIN WATER

Milcor Steel Co.,  
Mil., Canton, Chgo., LaCrosse, K. C.

### DAMPERS—QUADRANTS— ACCESSORIES

Aeolus Dickinson,  
Chicago, Ill.  
Hart & Cooley Mfg. Co., Chicago, Ill.  
Milcor Steel Co.,  
Mil., Canton, Chgo., LaCrosse, K. C.  
Parker-Kalon Corp., New York, N. Y.  
Young Ventilating Co.,  
Cleveland, Ohio

### DIFFUSERS—AIR DUCT

Aeolus Dickinson,  
Chicago, Ill.

### DRIVE SCREWS—HARD- ENED METALLIC

Parker-Kalon Corp., New York

### EAVES TROUGH

Barnes Metal Products Co.,  
Chicago, Ill.  
Berger Bros. Co., Philadelphia, Pa.  
Globe Iron Roofing & Corrugating Co.,  
Cincinnati, Ohio  
Milcor Steel Co.,  
Mil., Canton, Chgo., LaCrosse, K. C.

### EAVES TROUGH HANGERS

Berger Bros. Co., Philadelphia, Pa.  
Milcor Steel Co.,  
Mil., Canton, Chgo., LaCrosse, K. C.

### FANS—FURNACE

A-C Mfg. Co., Pontiac, Ill.

### FILTERS—FURNACE

American Air Filter Co., Inc.,  
Louisville, Ky.

### FLUXES—SOLDERING

Kester Solder Co., Chicago, Ill.

### FORMING ROLLS

Bertach & Co., Cambridge City, Ind.  
Interstate Machinery Co., Chicago, Ill.

# BUYERS' GUIDE

## FURNACE CLEANERS (See Cleaners—Furnace Vacuum)

## FURNACES FOR GAS OR OIL

Dall Steel Products Co., Lansing, Mich.  
Health-Air Systems, Ann Arbor, Mich.

## FURNACES—GAS

Henry Furnace & Foundry Co., Cleveland, Ohio  
Lennox Furnace Co., Marshalltown, Iowa  
Meyer Furnace Co., Peoria, Ill.  
Payne Furnace and Supply Co., Beverly Hills, Calif.  
Round Oak Furnace Co., Dowagiac, Mich.

## FURNACES—GAS AUXILIARY

Forest City Foundries Co., Cleveland, Ohio

## FURNACES—OIL BURNING

Motor Wheel Corp., Heater Div., Lansing, Mich.

## FURNACES—WARM AIR (See Also Unit Air Conditioners)

Agricola Furnace Co., Gadsden, Ala.  
Andes Range & Furnace Corp., Geneva, N. Y.  
Brillion Furnace Co., Brillion, Wis.  
Dall Steel Products Co., Lansing, Mich.  
Deshler Foundry & Machine Works, Deshler, Ohio  
Floral City Heater Co., Monroe, Mich.  
Forest City Foundries Co., Cleveland, Ohio  
Health-Air Systems, Ann Arbor, Mich.  
Henry Furnace & Fdy. Co., Cleveland, Ohio  
Hess Warming & Vent. Co., Chicago, Ill.  
Lennox Furnace Co., Marshalltown, Iowa  
May-Fiebeger Furnace Co., Newark, Ohio  
Meyer Furnace Co., The, Peoria, Ill.  
Motor Wheel Corp., Heater Div., Lansing, Mich.  
Mt. Vernon Furnace & Mfg. Co., Mt. Vernon, Ill.  
Payne Furnace & Supply Co., Beverly Hills, Calif.  
Round Oak Furnace Co., Dowagiac, Mich.  
Waterman-Waterbury Co., Minneapolis, Minn.

## GAGES—DRAFT

Ellison Draft Gage Co., Chicago, Ill.

## GRILLES

Auer Register Co., Cleveland, Ohio  
Harrington & King Perforating Co., Chicago, Ill.  
Hart & Cooley Mfg. Co., Chicago, Ill.  
Independent Register & Mfg. Co., Cleveland, Ohio

## GUARDS—MACHINE AND BELT

Harrington & King Perforating Co., Chicago, Ill.

## HANDLES—BOILER

Berger Bros. Co., Philadelphia, Pa.

## HANDLES—FURNACE DOOR

Fanner Mfg. Co., Cleveland, Ohio

## HANDLES—SOLDERING IRON

Parker-Kalon Corp., New York, N. Y.

## HEATERS—CABINET

Agricola Furnace Co., Gadsden, Ala.  
Motor Wheel Corp., Heater Div., Lansing, Mich.  
Mt. Vernon Furnace & Mfg. Co., Mt. Vernon, Ill.  
Payne Furnace & Supply Co., Beverly Hills, Calif.  
Waterman-Waterbury Co., Minneapolis, Minn.

## HEATERS—SCHOOL ROOM

Meyer Furnace Co., The, Peoria, Ill.  
Waterman-Waterbury Co., Minneapolis, Minn.

## HUMIDIFIERS

Automatic Humidifier Co., Cedar Falls, Iowa  
Clarm Mechanical Devices Co., Lima, Ohio  
Columbus Humidifier Co., Columbus, Ohio  
Hess Warming & Vent. Co., Chicago, Ill.  
Meyer & Bro. Co., F., Peoria, Ill.  
Sallada Mfg. Co., Minneapolis, Minn.

## MACHINERY—CULVERT

Bertsch & Co., Cambridge City, Ind.  
Interstate Machinery Co., Chicago, Ill.

## MACHINERY—REBUILT

Interstate Machinery Co., Chicago, Ill.

## MACHINES AND TOOLS—TINSMITH'S

Bertsch & Co., Cambridge City, Ind.  
Dreis & Krump Mfg. Co., Chicago, Ill.  
Interstate Machinery Co., Chicago, Ill.  
Marshalltown Mfg. Co., Marshalltown, Iowa  
Parker-Kalon Corp., New York, N. Y.  
Viking Shear Co., Erie, Pa.  
Whitney Mfg. Co., W. A., Rockford, Ill.

## METAL LATH—EXPANDED

Milcor Steel Co., Mil., Canton, Chgo., LaCrosse, K. C.

## MITERS

Barnes Metal Products Co., Chicago, Ill.  
Berger Bros. Co., Philadelphia, Pa.  
Milcor Steel Co., Mil., Canton, Chgo., LaCrosse, K. C.

## NAILS—HARDENED MASONRY

Parker-Kalon Corp., New York, N. Y.

## PERFORATED METALS

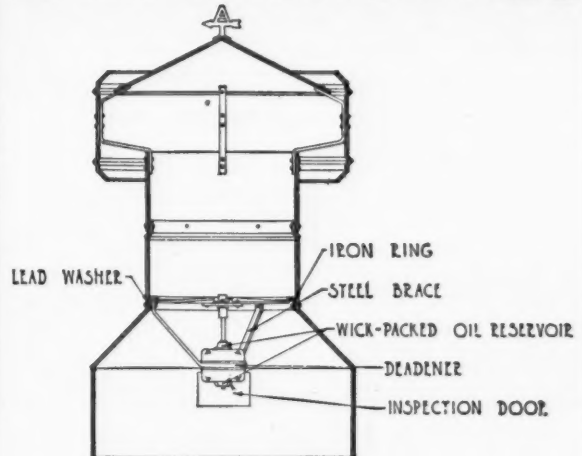
Harrington & King Perforating Co., Chicago, Ill.

## PIPE AND FITTINGS—FURNACE

Henry Furnace & Fdy. Co., Cleveland, Ohio  
Meyer & Bro., F., Peoria, Ill.  
Milcor Steel Co., Mil., Canton, Chgo., LaCrosse, K. C.

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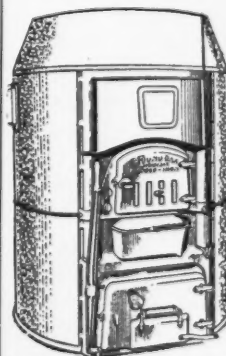
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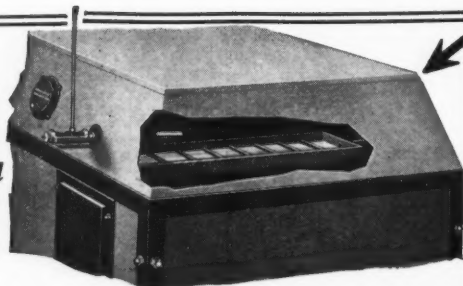
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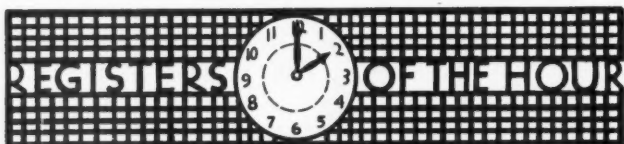
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### POKERS—FURNACE

Fanner Mfg. Co., Cleveland, Ohio  
Independent Reg. & Mfg. Co., Cleveland, Ohio

### PULLEYS—FURNACE

Hart & Cooley Mfg. Co., Chicago, Ill.

### PUNCHES

Bertsch & Co., Cambridge City, Ind.  
Interstate Machinery Co., Chicago, Ill.  
Parker-Kalon Corp., New York, N. Y.  
W. A. Whitney Mfg. Co., Rockford, Ill.

### PUNCHES—COMBINATION BENCH AND HAND

Parker-Kalon Corp., New York, N. Y.

### PUNCHES—HAND

Parker-Kalon Corp., New York, N. Y.  
W. A. Whitney Mfg. Co., Rockford, Ill.

### RADIATOR CABINETS

Hart & Cooley Mfg. Co., Chicago, Ill.

### REGISTERS

Auer Register Co., Cleveland, Ohio  
Forest City Foundries Co., Cleveland, Ohio  
Hart & Cooley Mfg. Co., Chicago, Ill.  
Henry Furnace & Fdy. Co., Cleveland, Ohio  
Independent Register & Mfg. Co., Cleveland, Ohio  
Milcor Steel Co., Mil., Canton, Chgo., LaCrosse, K. C.

### REGISTERS—WOOD

Auer Register Co., Cleveland, Ohio  
Milcor Steel Co., Mil., Canton, Chgo., LaCrosse, K. C.

### REGULATORS—AUTO- MATIC HEAT

Hart & Cooley Mfg. Co., Chicago, Ill.  
Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.  
White Mfg. Co., Minneapolis, Minn.

### REPAIRS—STOVE AND FURNACE

Brauer Supply Co., A. G., St. Louis, Mo.  
Des Moines Stove Repair Co., Des Moines, Iowa  
Northwestern Stove Repair Co., Chicago, Ill.

### RIDGING

Globe Iron Roofing & Corrugating Co., Cincinnati, Ohio  
Milcor Steel Co., Mil., Canton, Chgo., LaCrosse, K. C.

### RINGS—FURNACE CASING

Forest City Foundries Co., Cleveland, Ohio

### ROOF FLASHING

Globe Iron Roofing & Corrugating Co., Cincinnati, Ohio  
Milcor Steel Co., Mil., Canton, Chgo., LaCrosse, K. C.

### ROOFING—IRON AND STEEL

American Rolling Mill Co., Middletown, Ohio  
Globe Iron Roofing & Corrugating Co., Cincinnati, Ohio  
Inland Steel Co., Chicago, Ill.  
Milcor Steel Co., Mil., Canton, Chgo., LaCrosse, K. C.  
Newport Rolling Mill Co., Newport, Ky.  
Republic Steel Corp., Youngstown, Ohio

### ROOFING—TIN AND TERNE

Milcor Steel Co., Mil., Canton, Chgo., LaCrosse, K. C.  
Newport Rolling Mill Co., Newport, Ky.  
Republic Steel Corp., Youngstown, Ohio

### RUBBISH BURNERS

Hart & Cooley Mfg. Co., Chicago, Ill.

### SCREWS—HARDENED METALLIC DRIVE

Milcor Steel Co., Mil., Canton, Chgo., LaCrosse, K. C.  
Parker-Kalon Corp., New York

### SCREWS—HARDENED SELF-TAPPING, SHEET METAL

Milcor Steel Co., Mil., Canton, Chgo., LaCrosse, K. C.  
Parker-Kalon Corp., New York

### SCREENS—PERFORATED METAL

Harrington & King Perforating Co., Chicago, Ill.

### SCUPPERS

Aeolus Dickinson, Chicago, Ill.

### SHEARS—HAND AND POWER

Interstate Machinery Co., Chicago, Ill.  
Marshalltown Mfg. Co., Marshalltown, Iowa  
Viking Shear Co., Erie, Pa.

### SHEET METAL SCREWS— HARDENED, SELF- TAPPING

Parker-Kalon Corp., New York

### SHEETS—ALLOY

Inland Steel Co., Chicago, Ill.  
International Nickel Co., New York, N. Y.  
Milcor Steel Co., Mil., Canton, Chgo., LaCrosse, K. C.  
Newport Rolling Mill Co., Newport, Ky.  
Republic Steel Corp., Youngstown, Ohio

### SHEETS—BLACK, CORRUGATED, GALVANIZED

American Rolling Mill Co., Middletown, Ohio  
Granite City Steel Co., Granite City, Ill.  
Inland Steel Co., Chicago, Ill.  
Milcor Steel Co., Mil., Canton, Chgo., LaCrosse, K. C.  
Newport Rolling Mill Co., Newport, Ky.  
Republic Steel Corp., Youngstown, Ohio

### SHEETS—COPPER

American Brass Co., Waterbury, Conn.  
Revere Copper & Brass, Inc., Rome, N. Y.

### SHEETS—COPPER BEAR- ING STEEL

American Rolling Mill Co., Middletown, Ohio  
Granite City Steel Co., Granite City, Ill.  
Inland Steel Co., Chicago, Ill.  
Milcor Steel Co., Mil., Canton, Chgo., LaCrosse, K. C.  
Newport Rolling Mill Co., Newport, Ky.  
Republic Steel Corp., Youngstown, Ohio

## BUYERS' GUIDE

### SHEETS—COPPER (LEAD COATED)

American Brass Co., Waterbury, Conn.  
Revere Copper & Brass, Inc.,  
Rome, N. Y.

### SHEETS—IRON

American Rolling Mill Co.,  
Middletown, Ohio  
Granite City Steel Co.,  
Granite City, Ill.  
Milcor Steel Co.,  
Mil., Canton, Chgo., LaCrosse, K. C.  
Newport Rolling Mill Co., Newport, Ky.  
Republic Steel Corp., Youngstown, Ohio

### SHEETS—MONEL METAL

International Nickel Co., New York

### SHEETS—NICKEL

International Nickel Co., New York

### SHEETS—PURE IRON COPPER ALLOY

Newport Rolling Mill Co., Newport, Ky.

### SHEETS—REFINED OPEN HEARTH IRON

American Rolling Mill Co.,  
Middletown, Ohio

### SHEETS—SPECIAL FINISH

American Rolling Mill Co.,  
Middletown, Ohio  
Inland Steel Co., Chicago, Ill.  
Newport Rolling Mill Co., Newport, Ky.  
Republic Steel Corp., Youngstown, Ohio

### SHINGLES AND TILE— METAL

Globe Iron Roofing & Corrugated Co.,  
Cincinnati, Ohio  
Milcor Steel Co.,  
Mil., Canton, Chgo., LaCrosse, K. C.

### SKYLIGHTS

Globe Iron Roofing & Corrugated Co.,  
Cincinnati, Ohio  
Milcor Steel Co.,  
Mil., Canton, Chgo., LaCrosse, K. C.

### SNOW GUARDS

Berger Bros. Co., Philadelphia, Pa.  
David Levow, New York, N. Y.  
Rival Strap Corp., New York, N. Y.

### SOLDER

Kester Solder Co., Chicago, Ill.  
Milcor Steel Co.,  
Mil., Canton, Chgo., LaCrosse, K. C.

### SOLDER—ACID CORE

Kester Solder Co., Chicago, Ill.

### SOLDER—ROSIN CORE

Kester Solder Co., Chicago, Ill.

### SOLDER—SELF-FLUXING

Kester Solder Co., Chicago, Ill.

### STARS—HARD IRON CLEANING

Fanner Mfg. Co., Cleveland, Ohio

### STOVE PIPE AND FITTINGS

Meyer & Bro. Co., F., Peoria, Ill.  
Milcor Steel Co.,  
Mil., Canton, Chgo., LaCrosse, K. C.

### STOVE AND FURNACE TRIMMINGS

Fanner Mfg. Co., Cleveland, Ohio

### STRAINERS—ROOF

David Levow, New York, N. Y.  
Rival Strap Corp., New York, N. Y.

### STRAPS—ORNAMENTAL PIPE

David Levow, New York, N. Y.  
Rival Strap Corp., New York, N. Y.

### TINPLATE

Granite City Steel Co., Granite City, Ill.  
Milcor Steel Co.,  
Mil., Canton, Chgo., LaCrosse, K. C.  
Republic Steel Corp., Youngstown, Ohio

### TOOLS—TINSMITH'S

(See Machines—Tinsmith's)

### UNIT AIR CONDITIONERS

Andes Range & Furnace Corp.,  
Geneva, N. Y.  
Dail Steel Products Co., Lansing, Mich.  
Henry Furnace & Fdry. Co.,  
Cleveland, Ohio  
Health-Air Systems, Ann Arbor, Mich.  
Hess Warming & Ventilating Co.,  
Chicago, Ill.  
Lennox Furnace Co.,  
Marshalltown, Iowa  
May-Flebeiger Co., Newark, Ohio  
Meyer Furnace Co., Peoria, Ill.  
Motor Wheel Corp., Lansing, Mich.  
Payne Furnace & Supply Co.,  
Beverly Hills, Calif.  
Waterman-Waterbury Co.,  
Minneapolis, Minn.

### VACUUM CLEANERS— FURNACE

(See Cleaners—Furnace Vacuum)

### VENTILATORS—CEILING

Hart & Cooley Mfg. Co., Chicago, Ill.  
Henry Furnace & Fdy. Co.,  
Cleveland, Ohio  
Independent Reg. & Mfg. Co.,  
Cleveland, Ohio

### VENTILATORS—FLOOR

Aeolus Dickinson, Chicago, Ill.

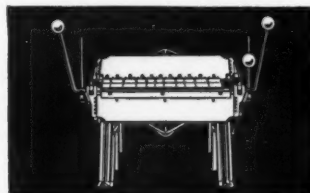
### VENTILATORS—ROOF

Aeolus Dickinson, Chicago, Ill.  
Berger Bros. Co., Philadelphia, Pa.  
Burt Mfg. Co., Akron, Ohio  
Jordan & Co., Paul R., Indianapolis, Ind.  
Milcor Steel Co.,  
Mil., Canton, Chgo., LaCrosse, K. C.

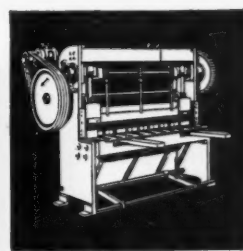
### WOOD FACES—WARM AIR

Auer Register Co., Cleveland, Ohio  
Milcor Steel Co.,  
Mil., Canton, Chgo., LaCrosse, K. C.

## CHICAGO



Box and Pan Brake



Power Squaring Shear

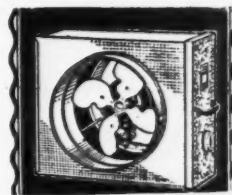
STEEL BRAKES—PRESSES—SHEARS

DREIS & KRUMP MFG. CO.

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CHICAGO

**A-C**  
*Thermostatically  
Controlled*  
**Automatic  
HEAT BOOSTER**

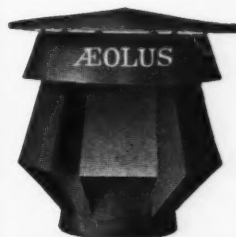


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One-Piece Ornamental Leader Straps

Patented July 10th, 1928; Jan. 6th, 1931

**MADE IN SIX STYLES**

Write for folder showing  
complete line and sizes

**STRAPS SOLD  
THROUGH  
JOBBER  
ONLY**



"Fitrite"  
Bronze  
Beehive Strainer  
For Round Leader  
3"-4"-5"-6"-7"-8" Dia.

Type "X"

"FITRITE" Bronze  
ROOF STRAINERS

3 types for roofs having inside cast iron  
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"Fitrite" Mop  
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"FITRITE" Adjustable  
PIPE SNOW GUARDS  
Galvanized Iron or  
Bronze  
Patent Pending

"FITRITE" SKYLIGHT GEARING

Iron or Bronze  $\frac{3}{4}$ ",  $\frac{1}{2}$ " and 1" sizes.  
Made also for chain operation.

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**DAVID LEVOW** 308 WEST 20th ST.  
NEW YORK

### Breuer's Ball Bearing 1932 TORNADO FURNACE CLEANER

Complete  
With These  
10  
Attachments



For Only

\$149.50

F.O.B. Chicago

### WHAT GOOD IS A FURNACE CLEANER WITHOUT THE RIGHT TOOLS?

You must have all of these 10 tools to clean thoroughly all types of warm air furnaces and hot water boilers. \$27.25 worth of extra attachments—that's what you get with a TORNADO Furnace Cleaner at no additional cost! They save approximately one hour on every cleaning job. Think what this means to you in extra profits.

Actually a one man outfit—100 per cent portable—weight only 30 pounds. Far greater vacuum cleaning power—proved by comparison— $\frac{1}{2}$  H.P. G.E. Motor—ball bearing throughout—no oiling.

Removes all loose dirt from air system without taking down pipes—an exclusive BLOWER feature of the TORNADO.

We invite comparison of the TORNADO point for po'nt—price, portability, weight AND POWER. We will ship the TORNADO on three days' free trial—no obligation—so that you can test our claims.

And you will want our new sales plan book that shows you how to go into the furnace cleaning business and earn profits that pay for the TORNADO in a few weeks. Write today.

**BREUER ELECTRIC MFG. CO.**  
865 BLACKHAWK STREET CHICAGO, ILLINOIS

## The "D-Q" Cleans THOROUGHLY —and you profit

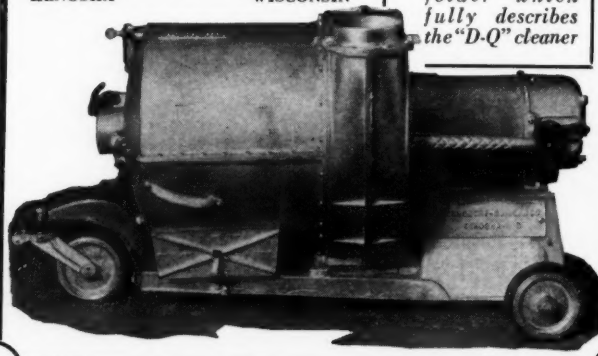
The "D-Q" Cleaner is a maximum capacity cleaner, one that does the most work in the least possible time, and at a maximum profit to you.

The "D-Q" Cleaner also does much to boost your reputation in your community, and is a means of encouraging future business.

Write for full details that will acquaint you with the "D-Q" Cleaner, and its money-making possibilities.  
**DENSMORE - QUINLAN CO.**  
KENOSHA WISCONSIN



Send for this  
folder which  
fully describes  
the "D-Q" cleaner



With the complete  
**ROCK ISLAND LINE**  
you are equipped  
to meet all register

### DEMANDS

**T**HE No Streak Register has won boosters because of its many features of construction, together with its pleasing appearance and low price.

No Streak Registers, like the complete Rock Island Line, are a source of constant profit to the dealers who handle them.

Get our catalog—it means money.

**ROCK ISLAND REGISTER CO.**  
ROCK ISLAND ILLINOIS



# CLASSIFIED ADVERTISING

## BUSINESS CHANCES

### LIGHTNING RODS

Dealers who are selling Lightning Protection will make money by writing to us for our latest Factory to Dealer Prices. We employ no salesmen and save you all overhead charges. Our Pure Copper Cable and Fixtures are endorsed by the National Board of Fire Underwriters and hundreds of dealers. Write today for samples and prices. Address L. K. Diddle Company, Marshfield, Wis.

## SITUATIONS OPEN

WANTED—ROOFING AND SHEET metal estimator and salesman; someone thoroughly experienced in the industry. Address Key 110, "American Artisan," 1900 Prairie Avenue, Chicago.

## SITUATIONS WANTED

SITUATION WANTED—HAVE HAD 28 years' experience as tinner and plumber. Am qualified to do work in the following lines: auto radiator repairing, erecting steel ceilings, pump and windmill repairing, steam and hot water work, installing radios, and any kind of mechanical job that comes in a shop. Can give good references. Address Key 121, "American Artisan," 1900 Prairie Avenue, Chicago.

SITUATION WANTED—A FIRST CLASS, A-1 Mechanic with more than twenty years' experience in all lines of the sheet metal trade wishes to hear from someone who needs a first class man. Can give best of references and go anywhere. Address Edward H. Collins, 154 Oakland Avenue, Macon, Georgia.

POSITION WANTED BY WELL EXPERIENCED hardware salesman in-store. Excellent references. Also, can put on sale to your advantage. Address Key 117, "American Artisan," 1900 Prairie Avenue, Chicago.

HEATING ENGINEER, WITH SALES promotion experience, would be willing to work with several dealers in same general locality. Organize and train your sales force both in sales and engineering. References exchanged. For particulars write Key 109, "American Artisan," 1900 Prairie Avenue, Chicago.

POSITION WANTED—AN EXPERIENCED heating man. Thirty-eight years of age. College education. Married. Seeks opportunity where compensation depends on ability and success. Fully versed in gravity, forced air, conditioned air, as well as gas installations. Capable of own layout work. With present firm seven years. Have following in my state. Honest; a hard worker who can produce. A-1 references as well as successful record of accomplishments. Address Key 107, "American Artisan," 1900 Prairie Avenue, Chicago.

SITUATION WANTED—A-1 SHEET metal worker, plumber and heating man with 25 years' experience at the trade. Strictly sober and reliable. Would like a good steady position. Would prefer Southern Wisconsin or Northern Illinois but will go anywhere. Address Key 119, "American Artisan," 1900 Prairie Avenue, Chicago.

SITUATION WANTED—BY FIRST-CLASS sheet metal, plumbing and heating man. Sixteen years' experience. Will go any place. A-1 references. Married. Address Key 108, "American Artisan," 1900 Prairie Avenue, Chicago.

SITUATION WANTED—MAN WITH real record of sales promotion in retail field and experienced air conditioning engineer is open for connection with manufacturer or large retail organization. Best of references. Address Key 116, "American Artisan," 1900 Prairie Avenue, Chicago.

## LINES WANTED

EXPERIENCED SALESMAN CALLING on furnace trade in Iowa can handle one or two good lines to advantage. Commission basis. Address Key 111, "American Artisan," 1900 Prairie Avenue, Chicago.

## LINES TO HANDLE

### MANUFACTURER

with complete line of Furnaces, Boilers, Radiation and Water Heaters has few open territories in Central West. Excellent earnings for producers. Address Key 115, "American Artisan," 1900 Prairie Avenue, Chicago.

## FOR SALE

FOR SALE—HEATING, PLUMBING AND Tin Business—Cheap—Good farming country. Reason for selling old age and ill health. Address Key 123, "American Artisan," 1900 Prairie Avenue, Chicago.

FOR SALE—COURSE IN SHEET METAL design and pattern drafting. Address F. Canonica, 108 So. Arizona, Butte, Montana.

WANTED—A FIRST CLASS TINNER TO buy or operate my shop on a commission basis. A wonderful opportunity for the right man. Old age and sickness compels me to give up the work. Address Key 122, "American Artisan," 1900 Prairie Avenue, Chicago.

FOR SALE—WELL ESTABLISHED sheet metal shop in central Illinois town of 3,500, also fully equipped for radiator repairing. Would consider terms with substantial down payment and good collateral. This is no sacrifice, as it is a going business and unless you have money and are really interested do not reply. Address Key 118, "American Artisan," 1900 Prairie Avenue, Chicago.

FOR SALE—ONE LOT OF SHEET metal working machines, including 8-foot Wooden Truss Brake, 30-inch and 36-inch Square Shears, Marshalltown Throatless Shear, 16-gauge hand power, Cross Lock Machine, twelve various type Burring Machines and 2 sets of 30-inch forming rolls. Above tools acquired in purchase of other shops and will dispose of them at sacrifice for quick sale. Wonderful opportunity for some sheet metal worker just starting up in the business. Smith & Burrows Company, Parkersburg, West Va.

## MISCELLANEOUS

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Patent and Trade Mark Law  
Barrister Bldg., Washington, D. C.

WANTED—PARTNER—MUST BE ABLE to do the soliciting and estimating. And a practical man at the business, able to make details and drawings for an old established shop doing ventilating, blower and dust collecting systems, cornice, skylights and general sheet metal work, and able to run a car. No capital required. Address Key 120, "American Artisan," 1900 Prairie Avenue, Chicago.

## LIVE MEN WHO CAN

advance themselves for future opportunities with Technical Training should prepare now. We have the finest courses in heating, ventilating (all branches), sheet metal, contracting, estimating, etc. Specialized courses provided at low prices. Write us your desires. No obligation. Information is free. St. Louis Technical Institute, 4543 Clayton Ave., Box 2, St. Louis, Mo.

## SHEET METAL MACHINERY

COMPLETE STOCKS—NEW—  
USED—HAND OR POWER

### This Week's Specials

PRESS BRAKE 10' 10 Ga. M.D.	\$1,000.00
30" NIA. PLAIN ROLLER	10.50
COMB. CRIMPER & BEADER	8.50
HOLLOW MANDREL STAKE	4.50

WE BUY—SELL—EXCHANGE

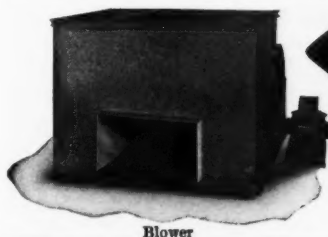
## INTERSTATE MACHINERY CO.

130 S. CLINTON ST., CHICAGO

SEND FOR BULLETIN C-2  
"INTERSTATE HAS IT"



Rolls—Shears—Brakes  
Press Brakes—Spot Welders  
Folders—Drills—Punch Presses



Blower

## Air Conditioning

• The Health Air Blower A Complete Air Conditioner •  
for New or Old Installations

Low Priced Write for our Attractive Proposition Efficient  
HEALTH AIR SYSTEMS, 1105 N. Main St., Ann Arbor, Mich.



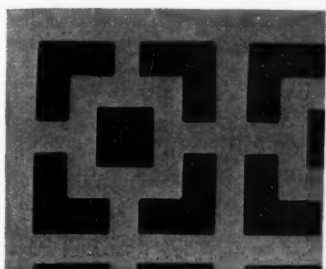
Air Conditioner

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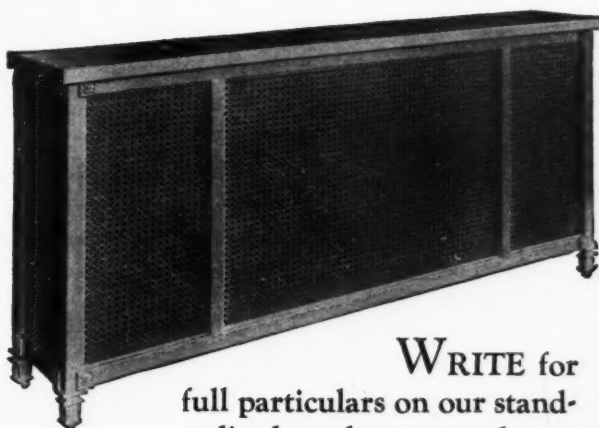
STYLE A-1 (Actual Size)

~ ~ 1932 ~ ~  
A YEAR FOR  
modernizing

concealed  
radiators

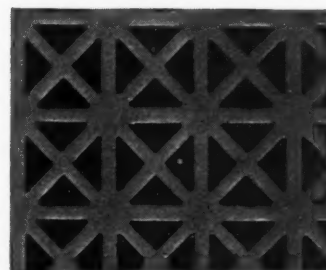
WILL PLAY A BIG  
PART ~ ~ ~ ~

A sheet metal man's job  
~ ~ ~ ~ ~  
Use H & K standardized parts



WRITE for  
full particulars on our stand-  
ardized stock parts and per-  
forated ornamental grille  
sheets.

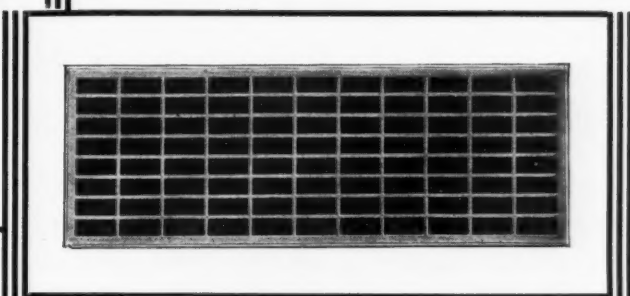
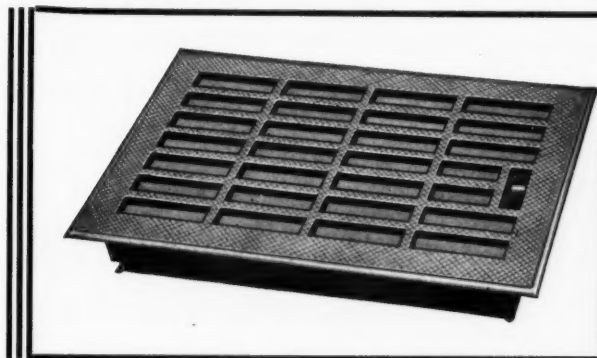
~ ~ AND BUILD  
sturdy . . .  
ornamental  
radiator  
enclosures  
IN YOUR OWN  
SHOP at LOW COST



The HARRINGTON & KING PERFORATING Co.  
5649 Fillmore Street

Chicago, Ill. PERFEX (Actual Size)

## A NEW LINE of REGISTERS by PEERLESS



Built By

FURNACE MEN WHO KNOW THE FURNACE MAN'S PROBLEMS

We Named Them PEERLESS DIAMOND GRID. It's easy to remember.  
PEERLESS DIAMOND GRID Registers and Faces are furnished in all  
the popular finishes.

Write for Circular—"NEW FACES WITH AN EXPRESSION."

Better Still—Order a Sample.

THE PEERLESS FOUNDRY COMPANY  
1845 - 1935 LUDLOW AVENUE , INDIANAPOLIS, INDIANA

# "By the gods, those flowers must not wilt"

*roared King Nebuchadnezzar*



Immediately there was consternation among the gardeners of the Hanging Gardens of Babylon. What was to be done? "Go high," the Oracle at Delphi said "and your problem is solved."

Tradition has it that they interpreted the words "go high" to be GOHI Sheet Metal. Ancient blue prints show plans for building irrigating system of water reservoir on top of hill and the water piped down through culverts, gutters, and downspouts of GOHI, made to last until 1932.

GOHI is an alloy of pure iron with the correct amount of copper. That is the reason for the high resistance to corrosion of this favorite, time-tested sheet metal.

This alloying of pure iron with copper also explains the easy working qualities, the

softness, and ductility of GOHI sheet metal.

Wherever and whenever it is necessary to combat the destructive elements of time, wear and weather, GOHI is the one safe, dependable, and economical sheet metal to use.

Write for the name of the Gohi Distributor near you

**THE NEWPORT ROLLING MILL COMPANY, Newport, Ky.**



IT'S THE PURE IRON, ALLOYED WITH  
THE RIGHT AMOUNT OF COPPER, THAT  
GIVES GOHI ITS LASTING QUALITIES.

# GOHI

PRONOUNCED "GO-HIGH"

# SHEET METAL

Historical Series No. 9. Reprints will be sent on request.

2

**A GOOD NAME  
TO TIE TO FOR**

*Profits*



CUSTOMERS soon find out the kind of stuff that's in sheet metal. That's why it doesn't pay to gamble with quality. Year in, year out, you can sell more sheet metal and make more money by staying with GLOBE BRAND. It was good 46 years ago and it's the same superior quality today — rust-resisting, wear-resisting — the metal that gives your customer service and gives you a good name. GLOBE quality is *always* the same because of full control of the manufacture of the metal as well as the fabrication of the products. There's a GLOBE Product for every sheet metal building need. Adequate stocks always ready for immediate shipment.

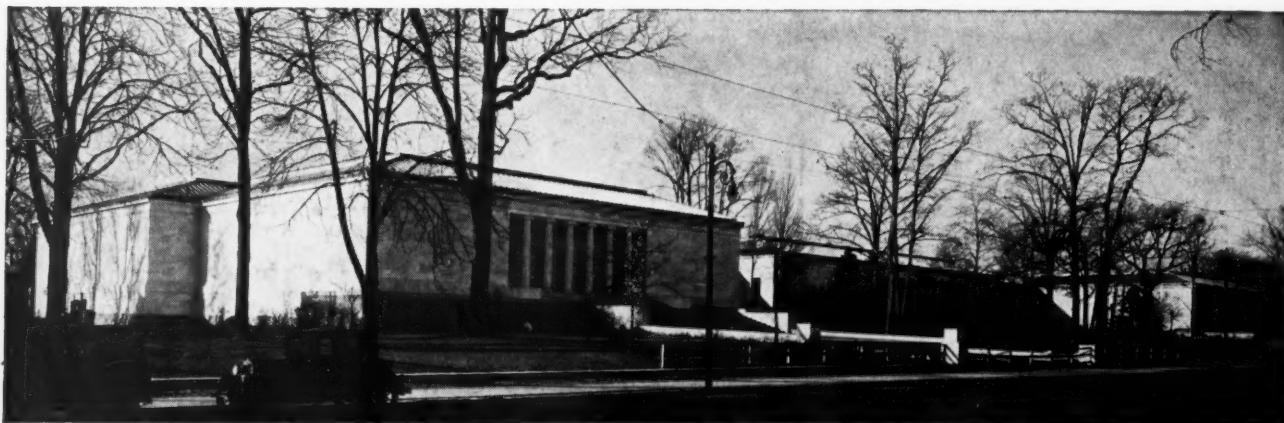
**SHEET  
METAL**

**Building Products**

THE GLOBE IRON ROOFING & CORRUGATING COMPANY, Cincinnati, Ohio

*Fabricators of Zinc Institute—Seal of Quality—Two Ounce Coated Galvanized Corrugated Roofing*

# 3 times they chose Revere Sheet Copper



*Toledo Art Museum, Toledo, Ohio, in which 250,000 pounds of Revere Sheet Copper were used for roofing and other sheet metal work*

In 1909, the original Toledo Art Museum was built. Revere Sheet Copper was used for the roof.

In 1924, a new unit was added. Revere Sheet Copper was again chosen.

In 1931, a second addition was made . . . two new wings. Revere Sheet Copper was selected . . . for the third time!

The last "job" called for 140,000 pounds of copper . . . and that makes 250,000 pounds altogether of Revere Sheet Copper in the Toledo Art Museum.

A fine example of how one Revere job leads to another.

+ + +

The Sheet Metal Contractor on the original job was Warnke Bros. Company. The Contractor

on the two additions was Fred Christen & Sons Company. Both are Toledo firms.

These contractors are consistent users of Revere products. They have built fine, successful businesses by combining quality workmanship with quality materials.

It isn't difficult to figure out how or why.

Revere products have prestige and reputation. Both help get business. Revere products have permanence and quality, which mean satisfactory jobs and good reputation for the contractor. And then, too, Revere products are *profitable* to handle.

It will pay you to find out more about Revere Sheet Copper, Revere Leadtex and other Revere products for Sheet Metal Contractors. Address Revere Copper and Brass Incorporated, 230 Park Avenue, New York City.

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## Revere Copper *and* Brass

INCORPORATED



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Dallas Division, Chicago, Ill.

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EXECUTIVE OFFICES: NEW YORK CITY

GENERAL OFFICES: ROME, N. Y.



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8

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